A Survey of DoD Facility Energy Management Capabilities

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A Survey of DoD Facility Energy Management Capabilities

Jeffrey A. Drezner

Melissa Bradley

Prepared for the
Office of the Secretary of Defense

National Defense Research Institute

RAND

PREFACE

Energy management is an important component of DoD's current emphasis on enhancing installation and infrastructure management capabilities. DoD's goal is to achieve a 30 percent reduction in facility energy consumption by the year 2005 (measured on a square-foot basis from a 1985 baseline). DoD has made progress toward its conservation goals; however, shrinking defense budgets, downsizing, restructuring, and various management reforms are drawing attention away from energy management at DoD installations.

This report documents RAND's multiphase research assessing DoD's capability to achieve energy policy goals at DoD installations. The research objectives were to identify what capability currently exists at DoD installations to implement energy policy effectively and to identify ways to enhance that capability through improved training and policy implementation.

This research should be of interest to DoD officials at all levels concerned with energy and installation management, as well as analysts and policymakers concerned with energy policy more generally.

This research was sponsored by the Energy and Engineering Directorate within the Office of the Under Secretary of Defense (Acquisition and Technology). The research was performed within RAND's National Defense Research Institute, a federally funded research and development center supported by the Office of the Secretary of Defense, the Joint Staff, the unified commands, and the defense agencies.

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In response to the constrained budget environment of recent years, DoD has placed increasing emphasis on enhancing installation and infrastructure management capabilities. Energy management is an important component of infrastructure management. DoD currently has a facility energy conservation goal of reducing consumption by 30 percent by the year 2005 (measured on a square-foot basis from a 1985 baseline). However, shrinking defense budgets, downsizing, restructuring, and various management reforms are shifting emphasis away from energy management at DoD installations.

This study identifies what capabilities currently exist at DoD installations to implement energy policy effectively. It also identifies ways to enhance that capability through improved training and policy implementation.[1] We use a survey research approach to address these objectives. Given the decentralized nature of DoD's energy management responsibilities and the importance of field-level installation energy managers in executing energy policy, a formal survey was the most direct way to assess current capabilities and identify barriers to successful implementation and conservation goal achievement. Energy managers at 330 installations completed the survey, a 53 percent response rate.

[1]This research addressed only facility energy (utilities) used for building heating and cooling, equipment usage, and other normal base activities. Mobility energy—fuel for transportation and weapon systems—is managed separately and is not addressed in this study.

To organize the information contained in the survey responses, we developed a conceptual model focused on identifying the factors affecting effective facility energy management and policy implementation. The model hypothesizes that effective implementation is a function of two broad categories of variables: the preparedness of the energy manager, and his or her ability to execute a program. The notion of preparedness includes the energy manager's background and experience, as well as energy-related training. Higher preparedness is more likely to lead to a successful energy program and achievement of conservation goals. Programmatic factors affecting implementation include time availability, level of effort, staff size and training, funding sources and availability, knowledge about potential conservation opportunities, and the awareness and cooperation of others at the installation.

With respect to implementation success and effective management, DoD has made substantial progress toward achieving facility energy conservation goals. Our results indicate the following:

- A 12 percent reduction in energy use per square foot had been attained by 1994. Thus, while some progress has been made, an additional 18 percent reduction is required by 2005; the average annual reduction in energy use will have to increase over previous years to achieve mandated goals.
- According to survey results, 50 percent of respondents indicated that they have identified the scope of potential energy conservation at their installations. Of this identified energy conservation potential, energy managers believe that 30 percent had been attained by 1995. If the audits that identified this potential conservation were conducted relatively recently (post-1985), then 30 percent attainment may contribute significantly toward energy conservation goals.
- Sixty-five percent of energy managers believe that their programs have been at least somewhat successful in saving energy. Sixty-one percent of energy managers believe that their programs have been at least somewhat successful in achieving energy conservation goals. However, energy managers feel that their programs have been relatively less successful in providing incentives to change behavior and in gaining the cooperation of other base functions and activities. These are two important intermediate

implementation goals in which performance appears to be less than desired.

- Sixty percent of energy managers believe that they will achieve the conservation goal of a 30 percent reduction in energy use per square foot by 2005 (1985 baseline). Sixty-seven percent of energy managers believe that they will have identified all projects with paybacks (recovery of investment to the break-even point) of less than 10 years. However, a substantial number of energy managers anticipate achieving only one or the other goal, and 22 percent of the respondents will not achieve either goal.
- Most energy managers define their functions fairly broadly and include a number of specific activities in performing energy management duties. Over 55 percent include nine or more activities, such as energy trends analysis, project identification and design, awareness and education programs, energy audits, and preventive maintenance. Specific responsibilities are tailored to the characteristics of the installation.
- Similarly, most energy programs include multiple projects—lighting, heating, ventilation and air-conditioning (HVAC), awareness, metering, etc. Lighting, awareness and education, building metering, and equipment modernization and replacement are the project areas most frequently cited as developed and implemented by energy managers and cited as the core of an energy program. The relatively small difference between developed and implemented projects indicates some success. Again, the mix of specific projects is tailored to the characteristics of the installation.

To a large extent, the relative success of DoD's energy program to date is due to the high quality of the installation energy management cohort. As a group, energy managers are well educated in appropriate backgrounds and are reasonably experienced in both how DoD works and the energy management function; they also define energy management in terms broad enough to include both managerial and technical elements. The fact that a majority would like to become formally certified energy managers and are planning on remaining in the energy management position for five or more years suggests a professionalism that positively influences energy program implementation success and outcomes.

Energy manager training appears to be just short of adequate. While the majority of energy managers have had some relevant training, relatively few energy managers have had the three core courses we believe provide the minimum foundation for effective implementation of an energy program: policy overview, general techniques of energy management, and building energy conservation. While funding appears to be a constraint in a relatively few cases, the availability of time to take courses appears to be a more widespread and serious constraint.

Some programmatic factors appear to pose significant constraints on the effectiveness of energy program implementation. Time available for performing the energy management function stands out as the most serious problem identified by our energy manager respondents. Over 75 percent believe that time availability is a serious problem affecting their effectiveness. Additionally, the time they do spend is not allocated efficiently among the various tasks included in energy management. In particular, too much time is spent on utility bills and reporting, while too little time is spent on project identification, project design, auditing, and awareness and education.

Respondents see the staffing issue as a major concern for fulfilling their job requirements. In fact, energy managers rated staff size second only to time available in problems for implementing a successful energy conservation program. Over 70 percent of the respondents felt that it was a moderate to large problem.

On funding-related issues, the respondents are equally distributed across the spectrum from no funding problems to funding as a severe constraint. For most energy managers, funding appears to be available from one or more sources. Retained savings—a funding source that could make a significant difference in that it is theoretically internal to the energy program—has not been successfully implemented and is thus making little contribution to the overall funding base.

Command support does not appear to be a severe problem. Seventy-five percent of energy managers believe that their commander is at least somewhat aware of the energy program. To some extent, awareness does translate into support, but the relationship is not necessarily strong. The largest problem in this category of factors is

the apparent inability of energy managers to affect the energy consumption incentives facing base tenants (all those who use energy on the base) and activities in a meaningful way.

The range of suggestions to improve the performance of installation energy programs reflects the range of problems and constraints experienced by the energy managers. Most energy managers acknowledge that no single action will resolve all identified issues. Some specific suggestions that appear to be supported by our analysis include the following:

- Increased use of metering, audits, and Energy Monitoring and Control Systems (EMCS) to improve the ability of energy managers to measure energy consumption and identify areas for improvement.
- Establishing effective incentives for energy consumers, both positive (rewards for saving) and negative (penalties for noncompliance). Consumers should be made more aware of and accountable for their energy consuming actions. A related suggestion is to improve organizational support for the energy program, including increasing command support, moving the energy management function to the command staff, and improving cooperation from other base functions.
- Enhancing energy awareness, education, and training, focusing mostly on base personnel (functional organizations, base tenants).

Two time-related suggestions offer perhaps the most opportunity for enhancing DoD's installation energy program. First, more time is required to carry out the functions of energy management effectively. At the least, energy management should be a primary duty. Second, a dedicated, knowledgeable staff supporting the energy manager is needed to enhance the effectiveness of installation energy programs.

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This research would not have been possible without the cooperation of energy managers at all levels of DoD. We greatly appreciate their support and willingness to spend time completing the survey and discussing energy management issues.

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The authors are responsible for any errors.

Chapter One

INTRODUCTION

In the constrained budget environment of recent years, the Department of Defense (DoD) has placed increasing emphasis on enhancing installation and infrastructure management capabilities. Energy management is an important component of infrastructure management. DoD currently has a facility energy conservation goal of reducing consumption by 30 percent by the year 2005 (measured on a square-foot basis from a 1985 baseline).[1] At the same time, DoD is attempting to comply with increasingly stringent environmental regulations, many of which have implications for energy management choices. However, shrinking defense budgets, downsizing and restructuring, and various management reforms are shifting emphasis away from energy management at DoD installations.

Energy consumption data for DoD illustrate both the magnitude of the challenge and the potential benefits of achieving the conservation goals. Reasonably reliable data on DoD aggregate energy consumption and costs have been maintained consistently only since 1975.[2] Figure 1.1 shows the total aggregate DoD energy consump-

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[1]Mobility energy—fuel for transportation and weapon systems—is managed separately and has its own set of conservation goals. This research does not address this area.

[2]DoD energy consumption and cost data from Department of Energy (DoE) Annual Report to Congress on Federal Government Energy Management and Conservation Programs, FY81–94, DoE/FEMP and Advanced Sciences, Inc. (Arlington, Va.). Energy consumption and cost data are reported by DoD to DoE/FEMP through the Defense Utility Energy Reporting System (DUERS). While information is input to DUERS at the installation level, it is reported to DoE/FEMP as aggregates. Thus, data on energy

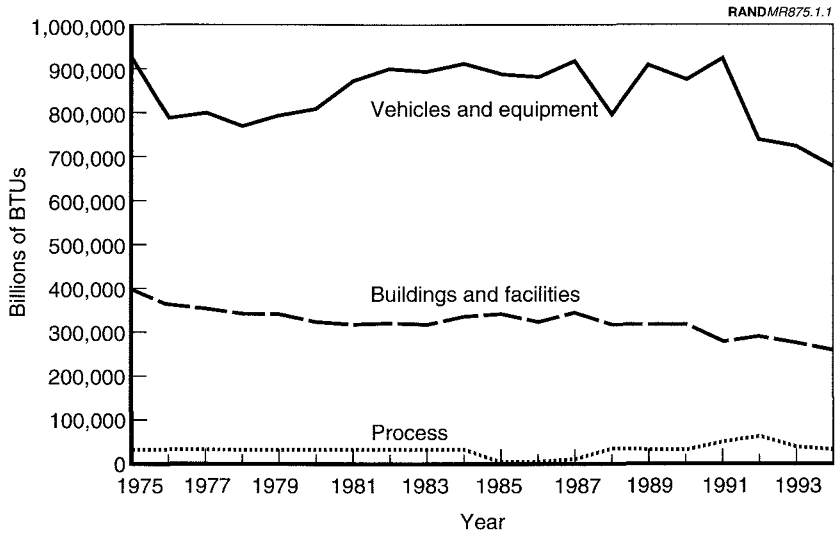

Figure 1.1—DoD Energy Consumption Trends

tion for three broad categories of energy over the period 1975–1994. The category "vehicles and equipment" is by far the largest energy use category. This category includes mobility fuels and is almost entirely petroleum-based. Thus, this category of use is sensitive to operating tempos. On average, mobility fuels have accounted for 70 percent of total DoD energy use over the period 1975–1994, with surprisingly little variation around that mean value. In contrast, buildings and facilities energy use has steadily declined from about 30 percent of total use in 1975 to 26 percent in 1994, a modest but real decline. On average, facility energy accounted for 27 percent of total use. The remaining 3 percent is process energy use, associated with the industrial facilities DoD owns and/or operates. Of the three categories, process energy is the only one to realize a net increase in consumption, 9 percent, over the period.

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consumption and cost were available to us only by energy type and use category for DoD as a whole, not by service or installation.

Energy costs are not as closely correlated with energy use as one might expect, as a result of differences in the mix of energy types consumed and their relative prices. Figure 1.2 shows the aggregate-level total costs for the three broad energy use categories. The cost of mobility fuels clearly shows the effects of the oil price increases in the early 1980s, and a smaller deviation in the early 1990s because of increased operating tempo associated with the Gulf War. On average, mobility fuels accounted for 62 percent of total DoD energy costs, or $6.6 billion (FY94 dollars) with a peak in 1982 at 74 percent. Facility energy costs are less variable and have been steadily declining in real terms but have increased as a percentage of the total. Facility energy costs were 33 percent of total DoD energy costs in 1975 and grew to 43 percent in 1994. On average, facility energy costs have been about $3.2 billion (FY94 dollars) over the period.

Figure 1.3 provides more-detailed information on DoD facility energy consumption—the focus of this research—over the period 1975–1994 by energy type. Overall, total facility energy use has decreased 383,200 billion BTUs (British thermal units) over the period 1975 to

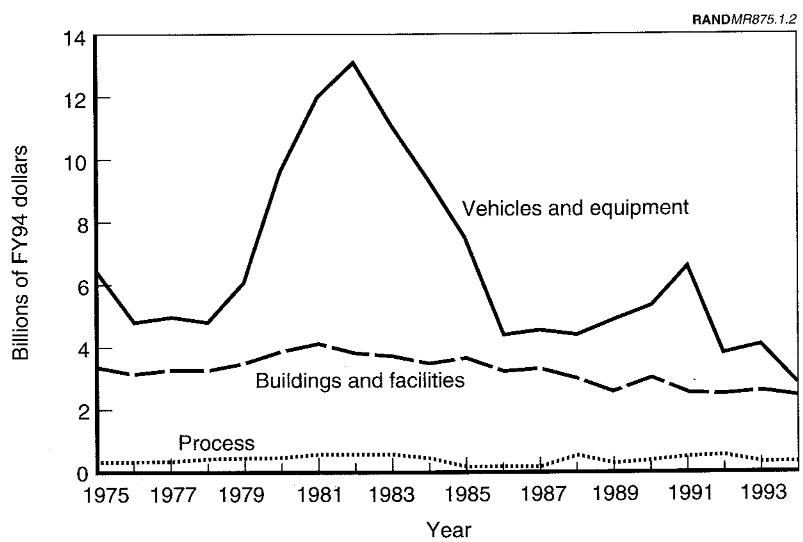
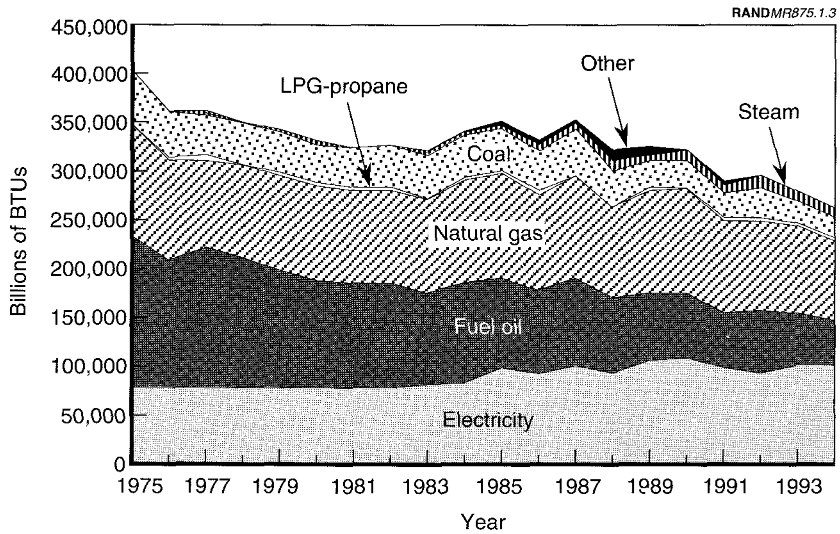


Figure 1.2—DoD Energy Consumption Costs



Note: LPG is liquefied petroleum gas.

Figure 1.3—DoD Facility Energy Use

1994, a 28 percent reduction. Coal and natural gas use have remained fairly constant over the entire period, averaging 11 percent and 30 percent of total use, respectively. However, coal use has dropped 4 percentage points over the last several years. Fuel oil use as a percentage of total use declined from 38.4 percent in 1975 to 18.4 percent in 1994, a substantial reduction. However, electricity use steadily increased over this period, from about 20 percent to 37 percent. This increase in electricity use is driven by the increasing use of electric equipment in daily operations (e.g., computers) as well as an increase in the number of buildings with air-conditioning.

Facility energy costs tend to reflect consumption trends. Figure 1.4 shows that electricity costs have accounted for 54 percent of total costs on average, rising from a low of 44 percent in 1981 to 67 percent in 1994. This increase is due in large part to the increase in electricity use over time, as well as to the high relative price of electricity on a BTU basis. Fuel oil costs have decreased dramatically, from 30 percent of total costs in 1975 to 10 percent in 1994. Because natural

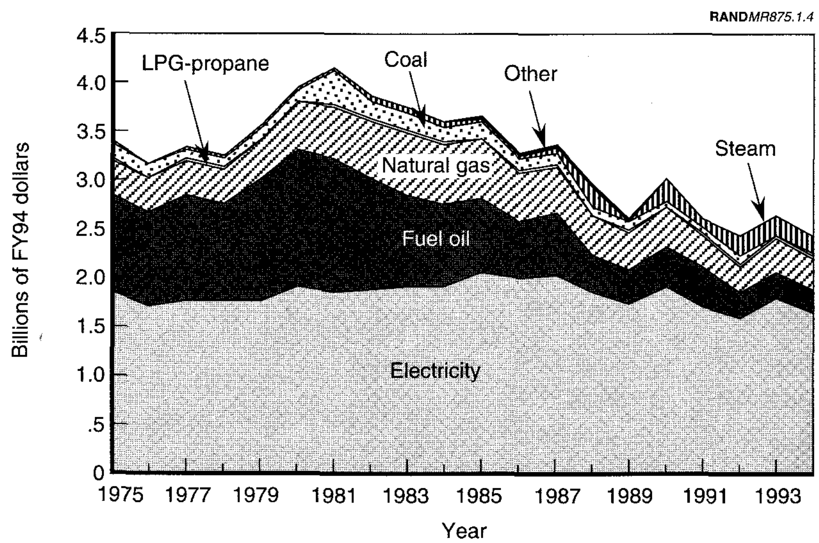


Figure 1.4—DoD Facility Energy Costs

gas use has remained relatively constant at about 30 percent, natural gas costs to DoD have not fluctuated very much, and have been 13.4 percent of total costs on average over the period.

These data suggest that the scope for facility energy conservation is fairly large: the potential benefits of a 30 percent reduction include a cost savings approaching $1 billion. While substantial progress in energy conservation has been made, achieving the 30 percent goal remains a difficult challenge. The DoD installation energy manager is the key to an effective facility energy conservation program that enables achieving these goals. The training and experience of the energy managers, as well as the tools and resources available to them, are important considerations in DoD energy management policy.

An additional issue is the extent to which institutional or resource barriers are hindering the ability of DoD energy managers to design and execute effective programs. Potential barriers include adequacy and availability of funding and staff, clear policy guidance, command

support, and cooperation from installation tenants (all those who use energy on the base) and other functional organizations.

RESEARCH OBJECTIVES AND APPROACH

This report documents RAND's research assessing DoD's current capability to achieve energy policy goals at DoD installations. The research objectives are to identify what capability currently exists at DoD installations to implement energy policy effectively and to identify ways to enhance that capability through improved training and policy implementation.

We adopted a survey research approach to address these objectives. Given the decentralized nature of DoD's energy management responsibilities and the importance of the field-level installation energy managers in executing energy policy, a formal survey was the most direct way to assess current capability and identify barriers to successful implementation and conservation goal achievement.

Sample and Representation

An initial list of military installations was assembled from several sources. The primary source was the 1994 Defense Utility Energy Reporting System (DUERS) (then called Defense Energy Information System (DEIS) II) database, which provided a list of installation identification codes (DoDAACs) as well as energy consumption, cost, and other installation characteristics affecting use. The DUERS database reports energy information at the DoDAAC level, not at the installation level, and many installations have more than one DoDAAC assigned. Since, for the most part, energy managers have responsibility for the installation as a whole, multiple DoDAACs were collapsed to create single installation codes where possible. This file was then supplemented with information provided by the energy policy offices in the Office of the Secretary of Defense (OSD) and the services, military publications, and discussions with knowledgeable individuals. From these sources, 807 installations across seven organizations were identified.

Once the initial installation list was created, sample installations were selected. Criteria for selection included that installations had to

be currently active and in the 50 United States or District of Columbia. The cases were then matched with energy manager contact lists provided by the energy policy offices in OSD and the services. Installations not included on the energy manager contact lists and those that could not be readily verified by other means were eliminated from the sample.

This screening resulted in 632 installations across the seven organizations. Table 1.1 provides the distribution of the potential sample sites and the chosen sample across these organizations.

Included in the 154 chosen Army installations were district engineers, ammunition plants, and depots. The Army National Guard had one selected installation per state, while the Air National Guard had multiple installations for many states. Navy installations proved to be the most difficult to identify. Only 207 of the 341 independent listings could be verified. One reason for this was that the Navy DoDAACs listed in DUERS were more difficult to collapse into the individual installations.

Data collection began in June 1995 with a telephone call to each of the selected installations to identify the appropriate respondent and verify mailing information. When possible, closed installations were identified and removed from the sample. The survey package mailed directly to each potential respondent included an introductory letter, the questionnaire, and a postage paid return envelope. The direct mailing was intended to help ensure confidentiality and an unbiased response.

Table 1.1

Population and Survey Sample

Service Organization	Potential Sample Installations	Chosen Sample
Army	168	154
Navy	341	207
Marine Corps	21	21
Air Force	115	89
Defense Logistics Agency (DLA)	11	10
Army National Guard	51	51
Air National Guard	100	100
Total	807	632

After approximately three weeks, prompting calls were made to respondents who had not returned a completed questionnaire. The call was intended to verify receipt of the package, answer any questions the recipient had, provide remails when necessary, and reschedule a completion due date. Approximately 250 questionnaires were completed.

A second wave of mailouts took place in April 1996.[3] The same procedure was followed as in the initial mailout. An additional 80 completed questionnaires were obtained.

Completed questionnaires were edited, cleaned, and coded prior to data entry.

Table 1.2 gives the final tally of completed questionnaires for each organization. During the field period, 34 of the sampled installations were identified as ineligible. The reasons for this included that the installation had closed or that there was no energy manager at the installation. This reduced the final sample size to 598 installations. Of the eligible installations, 330 completed questionnaires were received. Several respondents indicated responsibility for more than one installation on the initial mailing list; therefore, the 330 responses actually represent 339 sample installations, 56.7 percent of all installations sampled.

Table 1.2

Survey Sample and Response Rate

Service Organization	Ineligible	Final Sample	Completes	Completion Rate (%)
Army	10	144	80	55.6
Navy	15	192	91	47.4
Marine Corps	1	20	17	85.0
Air Force	5	84	60	71.4
DLA	2	8	5	62.5
Army National Guard	0	51	27	52.9
Air National Guard	1	99	59	59.6
Total	34	598	339	56.7

[3]Delays in project phase funding caused a gap in the survey effort.

The chosen sample included many of the installations listed as major bases in the *1995 Guide to Military Installations in the U.S.* To be included in this document, a base, station, or post must have at least 300 active-duty members assigned. The 1995 document included 243 major Army, Navy, Marine, and Air Force installations. As in Table 1.2, installations identified as ineligible were removed from the sample. Table 1.3 provides a breakdown of these major installations by service. The completed cases include a fair representation of these major installations.

Table 1.4 provides a description of the installations that did not respond to the survey. Of the 259 installations that did not respond, 23.2 percent were actually unlocatable; the address information we had did not prove to be accurate and no new information could be obtained. The majority of the remaining nonrespondents simply did

Table 1.3

Major Installations Responding to Survey

Service Organization	Major Installations (eligible cases)	Completes	Completion Rate (%)
Army	58	33	56.9
Navy	72	37	51.4
Marine Corps	17	14	82.4
Air Force	72	47	65.3
Total	219	131	59.8

Table 1.4

Nonresponding Installations

Service Organization	Total Number of Nonrespondents	Unlocatable	Refusals	Other
Army	64	18	4	42
Navy	101	34	1	66
Marine Corps	3			3
Air Force	24	2		22
DLA	3			3
Army National Guard	24	3	2	19
Air National Guard	40	3	3	34
Total	259	60	10	189

not complete the survey in the allotted time for data collection and provided no specific reason why; only 3.9 percent of the remaining cases were outright refusals.

Despite the large number of nonrespondents, we have no reason to believe that they differed in some systematic way from respondents.

Given the relatively large number of completed surveys (n=330) and the reasonably large proportion of major installations included in this sample, we believe that the sample is representative of DoD installations in general.

Overview of Questionnaire

The questionnaire was designed to cover a wide range of energy management issues including energy manager characteristics, program characteristics, and outside influences. It was developed in an iterative process through discussions with DoD energy managers at all organizational levels (OSD, service headquarters, major commands, installations). It was pilot tested using 50 installations and revised somewhat based on the results and feedback obtained.

The questionnaire is divided into five sections. The first section asks for name, title, and address information, and asks the respondent to confirm the DoDAACs for which he or she is responsible. The second section collects a variety of information on the background and work experience of the respondent. The third section of the questionnaire asks for information on the roles and responsibilities of the energy manager respondent, and attempts to determine the way in which the respondent spends his or her time performing energy management duties. The fourth section focuses on the educational and training background of the respondent. The final section examines the specific projects developed and implemented by the installation energy manager, and asks for his or her assessment of problems and constraints affecting energy management and the ability to achieve energy conservation goals.

The questionnaire takes approximately one hour to complete and includes open-ended questions and ample space for comments. The appendix contains a copy of the questionnaire.

DOD ENERGY POLICY AND MANAGEMENT STRUCTURE

An overview of DoD's energy management policy and the organizations responsible for implementation of that policy set the context for the analysis that follows.

Policy and Procedure

The sources and scope of DoD's energy management authority, the constraints on that authority, and the mechanisms available for execution of energy programs are essentially the same as for other federal agencies. Since 1975, a series of legislation and Executive Orders have defined and expanded federal energy management policy and procedures. The most important include the following:

- *The Energy Policy and Conservation Act* (1975)(EPCA)[4] requires development of a comprehensive national energy management plan, agency procurement standards for energy efficiency, and implementation of a 10-year conservation plan for federal buildings.
- *The Department of Energy Organization Act* (1977)[5] establishes the Federal Interagency Energy Policy Committee ("656 Committee") to strengthen energy conservation programs and facilitate cross-agency policy development and coordination.
- *The National Energy Conservation Policy Act* (1978)[6] establishes the use of the life-cycle cost method of project evaluation and a requirement for energy audits in federal buildings.
- *The Comprehensive Omnibus Budget Reconciliation Act* (1985)[7] authorizes the use of shared energy savings.
- *The Federal Energy Management Improvement Act* (1988)(FEMIA)[8] revises some of the earlier life-cycle cost (LCC)

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[4]Public Law 94-163 (15 U.S.C. 753 and 42 U.S.C. 6201).

[5]Public Law 95-91 (3 U.S.C. 19 and 42 U.S.C. 2201).

[6]Public Law 95-619 (12 U.S.C. 1451 and 42 U.S.C. 300).

[7]Public Law 99-272.

[8]Public Law 100-615 (42 U.S.C. 8201).

provisions, establishes a 10 percent conservation goal by 1995, directs agencies to establish energy conservation incentive systems, and creates the Interagency Energy Management Task Force.

- *The National Defense Authorization Acts* (NDAA) for FY89, FY90, and FY91[9] establish retention of savings provisions as incentives for use of SES (now ESPC)[10] contracts in DoD, and allows participation in utility rebate programs with similar retention of savings provisions.
- *Energy Policy Act* (1992)(EPAct92)[11] Subtitle F covers many items, including enhancements to previous LCC and SES/ESPC policy, updates goals and standards, directs DoE to provide for energy audits of federal facilities, directs the Office of Management and Budget (OMB) to develop guidance assessing energy use in federal buildings, and defines a "trained energy manager."
- Executive Order 11912 (1976) defines agency authorities and responsibilities for energy policy and conservation.
- Executive Order 12003 (1977) expands the requirements of EPCA 1975, specifies a goal of a 20 percent reduction in energy use per square foot in federal buildings by 1985 (1975 baseline), and delegates specific planning and management authority to agencies.
- Executive Order 12083 (1978) creates the Energy Coordinating Committee, which is composed of major agency Secretaries who coordinate policy and resources.
- Executive Order 12759 (1991) extends the reduction goal of FEMIA to a 20 percent reduction in energy use by 2000 (1985 baseline), requires industrial facilities to meet similar goals, and reinforces some past policy initiatives on demand-side management (DSM), procurement of efficient products, and alternative fuels.
- Executive Order 12845 (1993) establishes energy efficient acquisition standards for computer equipment.

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[9]Public Law 100-456, Public Law 101-189, and Public Law 101-510, respectively.

[10]SES is shared energy savings; ESPC is energy savings performance contract.

[11]Public Law 102-486.

- Executive Order 12902 (1994)[12] is designed to meet or exceed the energy and water efficiency provisions in EPAct92 and is related to the National Performance Review Initiative. This Executive Order (EO) establishes the goal of a 30 percent reduction in building energy use by 2005 (1985 baseline), directs comprehensive energy audits for government facilities, and reinforces the use of private-sector and retained savings as funding sources. It also directs the OMB to develop guidelines to allow agencies to retain rebates and savings from conservation activities in FY95 and beyond.

This list shows a general evolution both in the conservation goals associated with energy management and in the tools available to energy managers for achieving those goals.

The FY91 NDAA is particularly relevant in that it required DoD to develop energy performance goals and a plan to achieve those goals, limited energy conservation measures to those with a positive net present value over a period of 10 years or less, and provided that two-thirds of energy savings (from any source) remain available through the end of the following fiscal year—half reinvested in energy conservation measures, and half used as discretionary funding by the installation commander. This legislation formed the basis for what became the "retention of savings" policy.

DoD's energy program goals, policies, and implementation guidance are provided in a series of Directives (DoDDs), Instructions (DoDIs), and Defense Energy Program Policy Memoranda (DEPPMs). These documents range from general statements of goals and policy to specific instructions for entering into DSM or ESPC arrangements. Some of the more relevant documents include the following:

- *DoDI 4170.10 "Energy Management Policy"* outlines DoD energy policy, assigns responsibilities, and establishes energy management procedures.

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[12]Executive Order 12902, *Energy Efficiency and Water Conservation at Federal Facilities*, 8 March 1994.

- *DoDI 5126.47 "Department of Defense Energy Policy Council"* establishes the Defense Energy Policy Council to coordinate and review DoD energy policies, programs, and issues.
- *DEPPM 86-3 "Defense Energy Resource Management Program and Goals"* establishes goals for FY95, requires energy resource management plans from DoD components, and assigns "lead service" responsibilities for energy R&D activities.
- *DEPPM 91-2 "Implementing Defense Energy Management Goals"* provides detailed guidance for implementing a program to achieve the goals specified in the 13 March 1991 Deputy Secretary of Defense memorandum (DMRD 907).

An attachment to the 13 March 1991 Deputy Secretary of Defense memorandum recognizes that energy is critical to the defense mission in terms of productivity, quality of life, and environmental impacts. DoD policy is to "lead in energy resource management." This memo establishes facility energy conservation goals (20 percent reduction by 2000 from a 1985 baseline, measured in BTUs per gross square foot) and directs that each DoD component develop a plan to accomplish this goal. It also states that DoD components will comply with the retention of savings provisions established by Congress.[13]

Responsibilities of the Office of the Secretary of Defense

Energy management responsibilities are located in the Energy and Engineering Directorate within the Office of the Deputy Secretary of Defense for Industrial Affairs and Installations. This is a relatively small office with three full-time staff and additional support from energy managers from the field who rotate in one or two at a time and serve six months to a year under an internship-type program.

According to its mission statement, the Energy and Engineering Directorate (EED) is

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[13]These provisions are specified in section 736 of PL 100-456 (1988) as amended by section 331 of PL 101-189 (1989) and 10 U.S.C. 2865.

responsible for the development, implementation and oversight of Defense policy in the areas of energy and water resource management, utility energy acquisition, and installations facilities planning, design and construction. Technical areas of responsibility of the Directorate include: building design and construction standards; contracting policy concerning facilities, design and construction; energy performance contracting, utility procurement; long term energy and energy facilities contracting; and the demonstration and application of emerging and state of the art technologies.

This Directorate, in the areas of its technical responsibility:

1. Develops policies that implement public law, OMB Circulars, and Executive Orders,

2. Insures coordination and resolves disagreements between the heads of Service engineering and policy organizations,

3. Acts as the Defense liaison with foreign governments, other federal agencies and private professional and industry organizations,

4. Guides joint Service technical and policy development committees,

5. Provides representation to public commissions, DOD working groups, and non-government standard and policy development bodies,

6. Evaluates construction programs for execution, cost and quality,

7. Encourages and assists private financial institutions, developers, builders, operators, and military commanders interested in providing privately financed facilities,

8. Reviews plans, programs and budgets developed by the Military Departments and Defense Agencies,

9. Manages the Energy Conservation Investment Program and the Federal Energy Management Programs,

10. Acts as the Department point of contact of the coordination of utility acquisition and industry reformation issues, and

> 11. Develops, supports and implements legislative programs to improve the life-cycle cost effectiveness and quality of living and working conditions on Defense installations.
>
> In short, the Directorate works to provide policy, guidance and technical tools to help professional Defense installation managers improve mission support, while at the same time improving the living and working conditions of Defense personnel and their dependents at the lowest life-cycle cost.[14]

According to the basic energy management policy statement, OSD responsibilities include the following:[15]

- Establish policies and provide guidance to DoD components.
- Issue resource management goals, guidelines for, and oversight of DoD components' execution of the policy.
- Coordinate with other DoD organizations.
- Provide guidance and incentives for conservation.
- Establish criteria and monitor execution of Energy Conservation Investment Program (ECIP) (MILCON—military construction—funds) and ECAM (procurement funds) funding programs.

These are clearly top-level policy, coordination, and oversight functions. The DoD components (military services and defense agencies) are responsible for implementation.

EED has developed a general program to achieve DoD's energy conservation goals. Elements of the program include[16]

- establishing energy awareness programs
- improving facility operations and maintenance
- implementing energy conservation investment projects

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[14]Energy and Engineering Directorate, 1996.

[15]DoD Instruction 4170.10, 8 August 1991.

[16]*DoD Energy Manager's Handbook*, Washington, D.C.: Logistics Management Institute, 1994, p3-3/4.

- participating in public utility programs (e.g., DSM)
- implementing shared energy savings contracting (e.g., ESPCs)
- retrofitting lighting systems
- increasing use of alternative, renewable, and clean energy
- applying energy management and control systems (EMCSs)
- improving the energy efficiency of federal buildings
- procuring energy-efficient products.

Implementation procedures are fairly general and include environmental compliance, the use of life-cycle cost analysis to evaluate projects, and the use of "sound financial management practices."[17] Funding targets for Operations and Management (O&M), capital investment, and ECIP are included in the DEPPM. Again, significant flexibility to tailor implementation is provided in the guidelines. It is notable that substantial energy cost savings are assumed: The FY91–97 O&M accounts for the DoD components were reduced by one-third of the estimated energy cost savings from implementing an energy management program. The components were requested to ensure that an additional one-third of estimated savings be made available for re-investment in energy projects.

Responsibilities of the DoD Components

The DoD components are responsible for implementing the policy set by OSD. In general the components "shall plan and program resources for energy management, acquire and supply energy products, and assist DoD contractors to be energy efficient," where efficient is defined as life-cycle cost-effectiveness.[18] Specific responsibilities include

- implementing policies
- representing services in interorganizational groups

[17]DEPPM 91-2, 19 March 1991.

[18]DoD Instruction 4170.10, 8 August 1991.

- providing management and resources for policy execution
- establishing and executing an appropriate energy management structure (funding, tracking progress, training staff, etc.)
- promoting energy efficiency awards and recognition.

The listed responsibilities are fairly general, leaving significant flexibility for the DoD components to tailor implementation to their unique characteristics.

The general structure of the DoD components' energy management organizations is similar. At the component headquarters level, there is a central office that acts as the policy coordinator and provides implementation guidance and technical support. It can be part of either the military or civilian headquarters staff and is usually located within either the logistics or engineering functions.

The major commands within each service similarly have an official with responsibilities for energy management within that command. Major commands provide implementation (technical) support and communicate and interpret energy policies and guidance. They also monitor energy use and cost data for the installations within the command.

The installation energy managers (energy resource coordinators) are responsible for energy program implementation in the field. An installation energy manager's responsibilities include establishing specific goals and objectives, obtaining buy-in of base management, developing a plan to achieve those goals, coordinating implementation of that plan (which will necessarily involve base tenants—those using energy on the base—and other installation functions), and monitoring and evaluating program execution. Some installations have formal policy statements regarding energy management that detail these functions and assign implementation responsibilities across installation organizations. [19]

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[19]See, for instance, Department of the Army, Headquarters, I Corps and Fort Lewis, FL Regulation 11-1, "Fort Lewis Energy Management Program," 29 May 1991; Naval Air Station (NAS) Miramar Instruction 4100.1G, "Command Energy Conservation Program" (3 February 1993).

While the installation energy manager is formally responsible for developing and executing an energy conservation program that will achieve mandated goals, he or she faces several challenges associated with his or her organizational environment. First, the energy manager is usually buried deep within the installation, often part of the facilities engineering or public works organizations. Even though he or she is dependent on the participation of other installation organizations (e.g., accounting and budgets, facility maintenance, contracting, legal, environmental) to carry out his or her mission, he or she has no direct influence over these organizations, nor does he or she have any direct way to influence base tenants—energy users on the base. Second, tenants may not be directly responsible for the energy costs they generate. Thus, one of the most powerful incentives affecting energy conservation behavior—responsibility to pay for energy used—does not come into play at many DoD installations. Lastly, energy management and conservation is not a primary mission of DoD and may in fact be perceived as a constraint on training and readiness. Although the specifics vary from installation to installation, all DoD installation energy managers generally face these organizational challenges.

For the most part, there are no direct lines of command and authority among the officials responsible for energy management at the various organizational levels. Energy managers at OSD, component headquarters, major commands, and installations all work for different organizations and report up through different chains of command. This presents a fairly substantial coordination and incentive problem in terms of effectively and efficiently implementing DoD energy policy.

ORGANIZATION OF THIS REPORT

This research is focused on identifying the factors affecting facility energy management and policy implementation. Chapter Two describes the conceptual model underlying our research. The model hypothesizes that effective management and successful implementation are functions of two broad categories of variables: the preparedness of the energy manager, and his or her ability to execute a program. The model provides a logical organizing principle for this report. Chapter Two also provides data representing various mea-

sures of the dependent variable: effective management and policy implementation.

Chapter Three addresses the notion of the preparedness of the installation energy manager. In particular, the energy manager's background and experience, as well as energy-related training, are assumed to affect the preparedness of the energy manager. Higher preparedness is more likely to lead to a successful energy program and achievement of conservation goals.

Chapter Four addresses the broad set of programmatic factors affecting implementation. These factors include time availability and level of effort, staff size and training, funding sources and availability, knowledge about potential conservation opportunities, and the awareness and cooperation of others on the installation.

Chapter Five summarizes our findings within the context of the model and identifies those areas with particular leverage to affect the relative success of energy policy implementation. Other factors affecting outcomes, external to the model and DoD energy management, are also discussed. Based on this analysis, recommendations to enhance the effectiveness of DoD facility energy management are provided.

The appendix provides the questionnaire that was sent to energy managers for the survey.

Chapter Two

EFFECTIVE ENERGY MANAGEMENT AND POLICY IMPLEMENTATION

The conceptual model we develop in this chapter is intended to organize the data we obtained through the survey and to provide a tool to examine DoD ability to effectively implement energy policy and manage energy resources at the facility level. Our underlying premise is that effective implementation of energy management policy is more likely to lead to achievement of conservation goals, and that the presence or absence of certain factors may facilitate or hinder implementation.

We do not intend to suggest that we have captured all possible factors affecting energy management and conservation, but rather have formulated a model around the factors that appear to be important based on energy manager interviews and responses to the survey. For instance, there is a set of factors external to the energy management program that clearly affects implementation success, especially when defined in terms of conservation outcomes. Changes in the installation's mission, size and population, and operating tempo all affect conservation. We do not address these factors here. Further, we do not make a formal attempt to specify the model in a mathematical sense and estimate parameters.

A CONCEPTUAL MODEL OF EFFECTIVE IMPLEMENTATION

The model hypothesizes that effective implementation is a function of two broad categories of variables: the preparedness of the energy manager, and his or her ability to execute a program. Each of these is discussed in more detail below.

Effective Management and Implementation Success

Energy policy implementation success and effective energy management share similar concepts but represent different objectives. Implementation success is a complex concept with little agreement among analysts as to its definition.[1] It can include following procedures established in regulations with no regard to outcomes, or it can focus entirely on achieving the desired outcome (stated goal) of the policy with little regard to means. Effective management is also a complex concept focusing on the means to achieving a goal. It too can be measured in terms of process or outcome. Effective management is a subset of successful implementation.

For situations in which the dependent variable has multiple dimensions, it is useful to develop multiple metrics, each one measuring a different aspect of the dependent variable. Effective implementation and management can usefully (and appropriately) be defined in several different ways: energy use, cost, and conservation trends at both the aggregate and installation level; percentage of potential conservation achieved at both the aggregate and installation level; energy managers' assessment of the effectiveness of their program in achieving specific objectives that contribute to the ability to achieve the mandated conservation goals;[2] and whether the energy managers believe that the conservation goals will be achieved. The number and types of projects executed at the installation level also offer metrics for implementation success.

Energy consumption should trend downward if energy policy is being successfully implemented and energy use is effectively managed. This may be true for energy use overall (e.g., aggregate BTUs), or by

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[1]Bardach, Eugene, *The Implementation Game: What Happens After a Bill Becomes a Law*, Cambridge, Mass.: MIT Press, 1977; Goggin, Malcolm L., Ann O'M. Bowman, James P. Lester, Laurence J. O'Toole, Jr., *Implementation Theory and Practice: Toward a Third Generation*, New York, N.Y.: HarperCollins Publishers, 1990; Mazmanian, Daniel A., and Paul A. Sabatier, *Effective Policy Implementation*, Lexington, Mass.: Lexington Books, 1981; Palumbo, Dennis J., and Donald J. Calista, eds., *Implementation and the Policy Process: Opening Up the Black Box*, Westport, Conn.: Greenwood Press, 1990.

[2]Of course, this type of self-assessment is not an unbiased estimate of the dependent variable. Our conversations with installation energy managers were very candid, however; suggesting that the self-assessment included in the survey is not overly biased.

energy type (coal, natural gas, electricity, fuel oil, etc.). The costs may not necessarily mirror consumption trends, because of external changes in unit prices. Thus, the metric we use here is percentage reduction in energy use per square foot from the 1985 baseline.

At the installation level, the questionnaire asks the respondents to estimate how much of their identified potential for facility energy conservation they have achieved to date. While independent of the mandated goals, the result does reflect an installation energy manager's assessment of real progress to date, relative to what they believe is achievable.

There are intermediate goals that, if achieved, presumably lead to attainment of the overall policy objective. In this case, the ability of the energy manager to obtain the cooperation of other activities and functions on the base, provide incentives to change behavior, generate cost savings, and conserve energy can all be considered as necessary steps toward achieving a 30 percent reduction in energy use. The questionnaire asks for the respondent's self-assessment of how well his or her program achieves these goals, as well as the more general goal of energy conservation.[3]

The mandated policy objectives are to achieve a 30 percent reduction in energy use from the 1985 baseline and to identify and implement all energy and water conservation projects with a payback period (recovery of investment to the break-even point) of 10 years or less. The questionnaire asks whether the respondent believes he or she will achieve either one of these objectives.

The energy manager's perception of his or her roles and responsibilities is an indicator of effective management. We would expect to associate more-effective management with a broader recognition of the components of energy management.

The number and type of conservation projects developed and implemented can also be treated as a measure of implementation success. In one form, we simply calculate the difference between the

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[3]While there is some potential for a biased response here—relatively higher effectiveness ratings—we have found most energy managers were reasonably candid about the performance of their programs. Therefore, while we acknowledge the potential bias, we do not expect the impact of the bias to be significant in terms of general results.

number of projects developed versus those implemented. If substantially fewer projects have been implemented than developed, this may indicate a problem. A more complex metric would examine the mix of projects implemented to determine whether the key projects have been implemented in the majority of installations. These key projects would include awareness and education, more efficient lighting, and equipment replacement and modernization.

Preparedness of Energy Managers

The preparedness of installation energy managers directly affects their ability to implement energy policy and manage energy use effectively. The preparedness of energy managers is determined by a myriad of factors. Further, preparedness must be evaluated within an ever changing organizational context. We conceive of preparedness as composed of two broad categories of factors: background and education, and energy-related training. We measure only some aspects of each of these factors.

We would expect that energy managers with more years of service within DoD and of relatively higher rank would be more-effective managers. They are presumed to be more aware of how the organization works and how to accomplish implementation in the highly constrained public sector environment. In other words, energy managers with more years of service are more likely to be "installation entrepreneurs"—able to successfully execute a program even in an organizationally complex operating environment.

We would also expect that energy managers who have been in the job longer and/or whose previous work experience was closely related to the activities that relate to energy management would be relatively more effective. The expectation of being in the energy management position for a significant time into the future might also motivate better performance.

Similarly, we hypothesize that civilian energy managers would be relatively more effective than military energy managers because they tend to be more experienced in energy management, stay in the position longer, have better energy-related training, and spend more of their time on energy management functions. This has more to do with the nature of the difference in career path and orientation be-

tween civilian and military personnel, rather than with differences associated with individual characteristics.

More-effective energy managers are likely to have academic backgrounds that include formal training in a technical area (e.g., engineering).

Appropriate training is the other broad category of energy manager quality we address in this research. It is important that the adequacy of an energy manager's training be assessed within the context of the needs of his or her installation. Energy management–related training appropriate to a very large installation may be overkill for a facility that consists of a single commercial building.

The questionnaire asks respondents about their energy-related training in many different ways. We ask whether the respondent is a Certified Energy Manager according to the criteria of the Association of Energy Engineers or similar organizations. A Certified Energy Manager is assumed to have a core set of training critical to good performance. Certification also implies a level of professionalism and dedication that should contribute to both quality and performance.

Early training upon assuming the position of energy manager is assumed to contribute to better performance. Skills are acquired and refined more quickly, and projects can be identified and implemented sooner.

The availability of funding for energy-related training is presumed to be important to energy manager performance. Energy managers are more likely to attend needed training courses, and keep themselves apprised of new developments in the field, if adequate funds are available to attend courses, seminars, and workshops.

The number and type of courses attended is perhaps our most direct measure of energy management training. We assume that certain core courses are critical since they provide basic information needed by most energy managers: general policy overview, general principles of energy management, awareness and education, and building energy conservation (since all installations have buildings). Other courses are assumed to provide supplemental training specific to the needs of the installation.

Programmatic Factors Affecting Implementation

Programmatic factors affecting implementation are defined as factors external to the characteristics of the energy managers. Regardless of the preparedness of the energy manager, these factors may have an affect on the ability of an energy manager to execute an installation energy program that has a high probability of achieving conservation goals. We consider programmatic factors in five broad categories: time, staff, funding, information, and awareness and cooperation.

Energy managers who can spend more time focusing on energy management activities should be able to produce relatively better results, all else being equal. We consider whether the respondent considers energy management his or her primary duty or as an extra duty, as assigned; the percentage of time spent on energy management activities; and the extent to which the energy manager is spending time on those activities considered critical to effective management.

Staff issues can sometimes be a problem at larger installations. We thus ask about the number of personnel at the installation with energy management responsibilities and whether this poses a problem in terms of effective implementation.

Funding availability is also critical to good performance: At its core, energy conservation often requires an investment today to achieve savings in future years. Thus, we examine funding availability, amount, and sources. We also look at the retention of savings policy mentioned earlier as a potential continuous source of funds.

Time, staff, and funding can be considered resources that are necessary for effective energy management. Information about energy conservation potential is another such resource. We ask whether the respondent knows what the potential for conservation is and how that potential was identified, usually through some type of energy audit. We also examine the range of information sources energy managers use to generate ideas about conservation projects. The notion here is that a wider range of sources provides a richer set of ideas.

A common misinterpretation of the energy management function is to think of it as an entirely technical job; there is a very important managerial element. This includes making base tenants aware of energy conservation opportunities, eliciting their support and cooperation, and obtaining the cooperation of other activities and functions on the base required to actually execute conservation projects. We use the organizational location of the energy management function as a measure of his or her ability to effectively obtain such cooperation. We also examine the support of the base commander, ultimately the provider of resources.

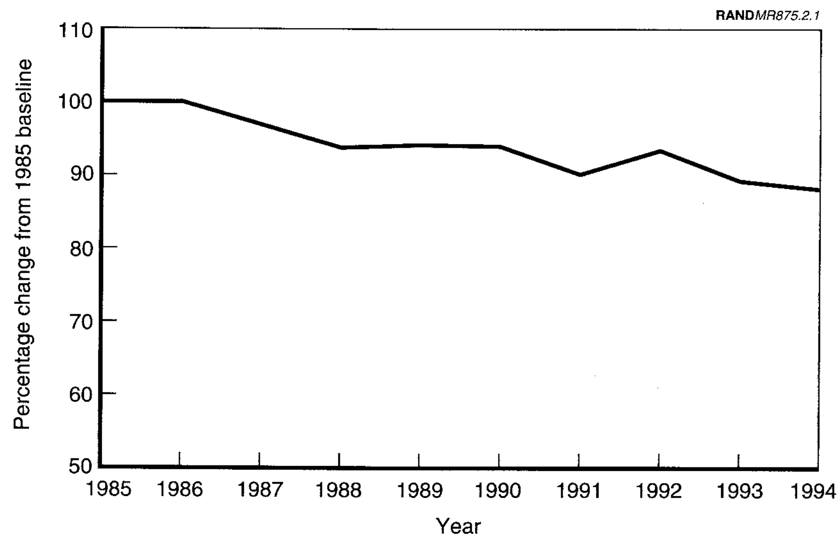
MEASURES OF IMPLEMENTATION SUCCESS

This section provides information on the measures of effective management and implementation success defined earlier. In general, the measures suggest that some progress has been made toward successful implementation and effective management, but that there remains room for improvement.

Figure 2.1 shows that DoD facility energy use has declined by about 12 percent over the period 1985 to 1994.[4] The base year from which the current goals are measured is 1985. Gross square footage of floor space has declined by 14 percent over the same period. Thus, while some progress has been made, an additional 18 percentage point reduction is required by 2005 to meet the goals specified in Executive Order 12902. Conservation rates will have to increase over previous years' rates to achieve this goal.

Fifty percent of the respondents indicated that the potential scope for energy conservation at their installation had been identified. An average of 30 percent of the identified potential has been attained, according to the energy managers in our sample. The distribution is slightly skewed, with 46 percent of energy managers indicating that 16 percent or less of the identified potential has been attained, about 33 percent indicating that between 20–50 percent of potential has been attained, and 21 percent indicated 50 percent or more attainment. It is not entirely clear how to evaluate this perceived progress.

[4]Since 1975, DoD facility energy use has declined approximately 30 percent, measured on a BTU-per-square-foot basis.



NOTE: Conservation trend based on BTUs per square foot of building floor space.

Figure 2.1—DoD Facility Energy Conservation Progress to Date

If the audits that identified the potential were conducted relatively recently, then 30 percent attainment may be considered significant. If relatively more time has passed, or the identified potential is significantly less than the true potential, then 30 percent attainment may not contribute significantly toward the 30 percent energy conservation goal.

Table 2.1 presents the energy managers' perception of how effective their installation energy program has been over a number of relevant dimensions, given what they thought was reasonably possible. Sixty-five percent of respondents believe their programs have been at least somewhat effective in conserving energy, and 61 percent believe that their programs have been at least somewhat successful in achieving their conservation goals. Energy managers feel that their programs have been relatively less effective in providing incentives to change behavior and in gaining the cooperation of other base functions and activities. Overall, Table 2.1 reflects a fairly good self-

Table 2.1

Energy Manager Self-Assessment of Program

Program Area or Goal (No. of observations)	Effectiveness Rating (number of responses)				
	Very effective	Somewhat effective	Neither effective nor ineffective	Somewhat ineffective	Very ineffective
Obtaining cooperation from other activities (298)	24	130	52	66	26
Providing incentives for conservation behavior (299)	5	47	84	81	82
Generating cost savings (298)	48	137	51	39	23
Generating energy savings (300)	43	135	34	51	19
Achieving conservation goals (300)	54	128	42	48	28

assessment of installation energy programs, even though the absolute number of responses in the ineffective category suggests a large scope for improvement.[5] For the most part, respondents who consider energy management as a primary duty are more likely to consider their programs relatively effective across the range of goals listed in Table 2.1.

Table 2.2 shows the energy mangers' assessment of their ability to accomplish the two formal goals of the DoD facility energy program. Most energy managers in our sample believe that they will achieve both the goal of identifying all energy conservation projects with a payback of less than 10 years and will also achieve a 30 percent reduction by 2005 from the 1985 baseline. However, a substantial number of energy managers anticipate achieving only one or the other goal, and 22 percent of the respondents will not achieve either

[5]The relatively high percentage of respondents (30–40 percent) who rate their programs as either ineffective or neither effective nor ineffective suggests that the potential bias in these self-assessments is relatively low.

Table 2.2

Goal Achievement Assessment

	Energy Use Reduction Goal (No. of respondents)		
Payback Goal Achievement	Yes	No	Total
Yes	146	53	199
No	33	67	100
Total	179	120	299

goal. The majority of "other-duty" energy managers (those who identify energy management as an extra duty) consider identifying all projects with a 10-year payback a more achievable goal than do "primary-duty" respondents (those who identify energy management as their primary duty).

Energy management entails a wide range of activities. Table 2.3 lists 16 categories of energy management activities and gives the number

Table 2.3

Energy Manager Roles, Responsibilities, and Functions

Energy Management Function	Number of Respondents	Percentage of Total
Tracking or analysis of trends	270	81.8
Formal or informal reporting	217	65.8
Review of utility bills	186	56.4
Utility forecasting	160	48.5
Utility metering	141	42.7
Awareness and education	257	77.9
Conduct/participate in energy working groups	207	62.7
Contract monitoring or negotiation	122	37.0
Identification of projects	266	80.6
Design of projects	155	47.0
Prepare project proposals	206	62.4
Oversight of project execution	184	55.8
Technical support for projects	203	61.5
Review designs for nonenergy projects	210	63.6
Conduct energy audits	141	42.7
Preventive maintenance	126	38.2

of respondents (and percentage of total) who indicated that they consider this part of their function. Over 80 percent of the respondents indicated that tracking and analyzing energy consumption trends and identification of energy conservation projects were activities included in their definition of energy management. Awareness and education activities was the third most frequently indicated energy activity, with 78 percent of respondents including this as part of their definition of energy management. These three activities might thus be considered the core elements of an effective energy management program. It is notable that at the bottom of the list of roles and responsibilities were preventive maintenance and contract monitoring and negotiation, with 38 percent and 37 percent, respectively. While this is considerably lower than the most frequently cited activities, over one-third of the respondents do consider such activities as part of their jobs.

Perhaps more telling is that the vast majority of respondents define their roles to include more than one of these activities. In fact, 55 percent of the respondents indicate that they include nine or more of these tasks in their energy management role. Almost 4 percent indicate that they are responsible for all 16 activities listed in Table 2.3. Another 4 percent indicate that they include all listed activities except preventive maintenance. Another 2 percent indicate that they include 15 of the activities in various combinations. This variation suggests a wide range of definitions for the energy management function—and considerable tailoring to the characteristics of an installation.

Table 2.4 lists the various categories of projects that compose an installation energy program and compares the number of these projects that have been developed (designed) with the number actually implemented.[6]

Except for lighting projects, fewer than half of the total sample of energy managers indicated developing energy conservation projects in any area. Lighting, awareness and education, building metering, and

[6]The questionnaire also asks for respondent assessment of the success of those projects that were implemented. For the most part, over 80 percent of respondents indicated relative success. This lack of variation makes this part of the response uninteresting in terms of analysis.

Table 2.4

Components of Installation Energy Programs

Project Type	Developed	Implemented
Awareness	156	145
DSM	48	35
ESPC	26	11
Metering	136	116
Lighting	190	147
Preventive maintenance	105	91
Equipment modernization	123	109
UMCS[a]	93	78
Alternative energy sources	32	27
Building energy monitor program	110	88
Activity energy management team	80	62
Water conservation	46	47

[a]Utility management and control system.

equipment modernization and replacement are the project areas most frequently cited as developed by energy managers. These same four categories are also cited as most frequently implemented. These categories of projects are the core of an energy program, and the relatively small difference between developed and implemented projects indicates some success.

At the time of this research, more projects were designed and developed than actually implemented for all categories. The largest differences are in the lighting, building energy monitor, and metering areas.

The 12 specific project types listed in Table 2.4 were used in 168 different combinations by 246 respondents. Again, a wide range of different mixes is apparent with no real dominant pattern. The most frequent combinations were pairs of metering and lighting projects (7) and awareness and lighting projects (7). In general, primary-duty energy managers appear to implement relatively greater mixes (combinations of a greater number of projects) than do other-duty energy managers. The wide range of project mixes suggests significant tailoring to the unique characteristics of an installation, and also reflects the unique set of constraints facing each energy manager.

Chapter Three

PREPAREDNESS OF INSTALLATION ENERGY MANAGERS

Energy manager preparedness is important because of the decentralized nature of DoD energy management and the fact that an installation conservation program needs to be tailored to the particular circumstances of an installation. We define the preparedness of energy managers in terms of the appropriateness of their background (academic, previous jobs, experience levels) and training. Appropriate training is a rather complex concept in itself and is a function of the level of core knowledge gained through experience or academic background, core energy management training, supplemental courses as needed, the ability to obtain more training (number of courses, funding availability), and the ability to draw on a wide range of information sources.

BACKGROUND AND EXPERIENCE

In assessing the appropriateness of the background and experience of DoD installation energy managers to energy management, we examine a variety of characteristics including their rank or grade level, years spent in a military environment, how long they have worked on energy management issues in the military, and their additional job-related experience. We also look at how long they anticipate being in their current position. These items taken together help us to make some basic assessments on position placement, expertise, level of commitment, and relative authority.

By far, the majority of the energy managers we surveyed are civilian employees of DoD (68.3 percent); the remainder are military personnel. This distinction is important in that civilian personnel tend to

remain in their jobs for longer periods of time and follow a more narrowly defined career path. They are transferred less often. Thus, the previous work experience of civilians is more likely to be relevant to energy management than that of military personnel. They are more likely to be committed to energy management as a profession and thus pursue energy management–related training.

Also important is the rank or federal employee job classification or "general schedule" (GS) level of the energy managers. This information can give a clue as to the level of experience of the person assigned to the energy function and thus the relative importance given to the position. Approximately 67 percent of civilian energy managers held a GS-11 or higher designation. The military energy managers were divided into a wide variety of ranks, the majority found among the major, lieutenant, and captain ranks. In the case of both civilian and military personnel, energy mangers tend to be mid-level managers.

DoD energy managers responding to our survey are generally well educated; 77 percent have bachelor degrees or higher. Ninety-three percent have some type of education beyond high school. Most respondents have an educational background in engineering (42 percent), although a substantial number (19 percent) have management degrees. If the management and other categories are treated as nontechnical, then this sample of energy managers is split about equally between technical and nontechnical educational backgrounds.

The fact that the majority of energy managers are civilians, of relatively high rank or GS designation, and well educated would seem to bode well for energy management at the installations for two reasons. First, energy managers should be relatively stable in their positions, and second, they should be skilled in energy management issues.

It also is likely that energy managers who are more familiar with the structure and workings of the military would have an easier time accomplishing their duties. Such familiarity can be measured in terms of the length of time respondents have been employed by DoD either as a civilian employee or in active military service. The mean time respondents were employed by DoD was 14.8 years. Figure 3.1 shows the distribution of the answers. The median number of years

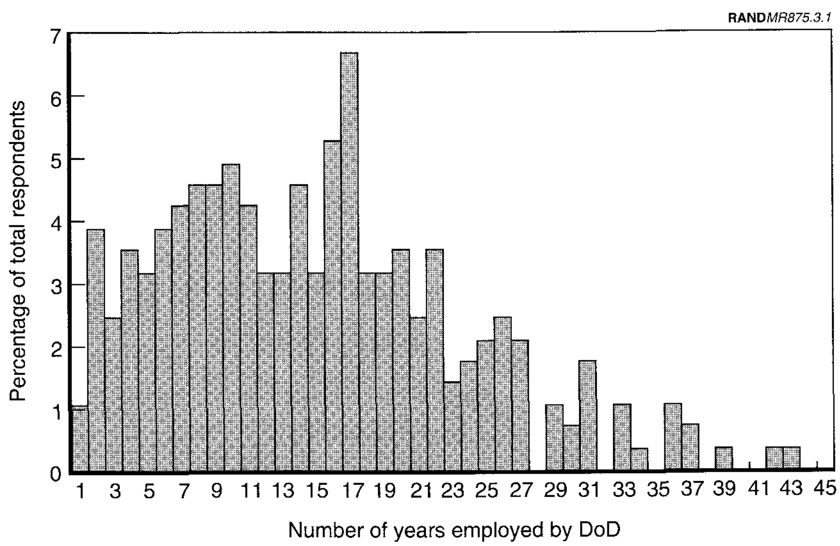


Figure 3.1—Years Employed by DoD

employed by DoD is 14.3 years. The distribution shows that while a few respondents have had a great many years of service, over 13 percent of energy managers have had less than five years of service.

We further examine experience by asking about the length of time the respondent has been energy manager at their current activity. The mean time spent as energy manager was just under 4 years, and the median time was 2.75 years. As can be seen in Figure 3.2, the distribution is heavily skewed toward the left with over 20 percent of energy managers having been in their current position for only one year or less. This represents a relatively high level of turnover in the energy manager position, and thus a loss of knowledge and experience.

We can also examine the positions that respondents held prior to becoming energy manager at their current installation. If an energy manager is relatively new at his or her current position, then we would hope to see that he or she held other positions that were rele-

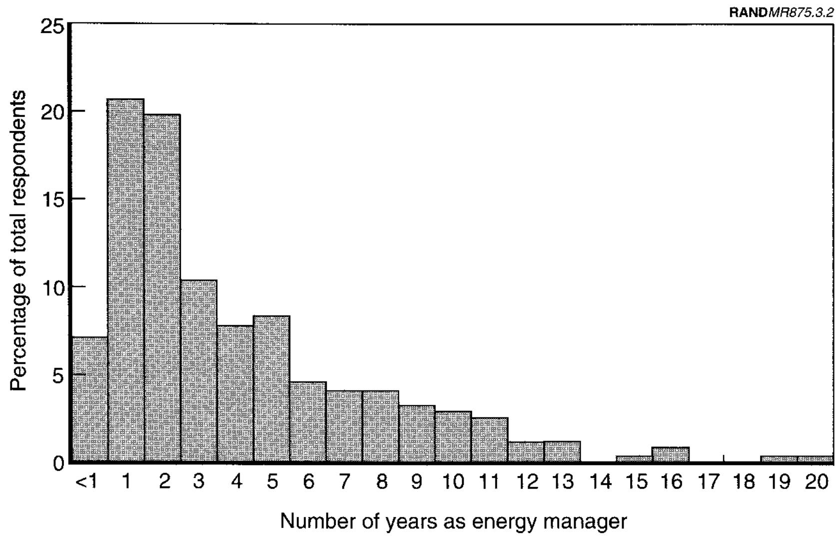


Figure 3.2—Years in the Energy Management Position

vant to energy management. In fact, of the 50 energy managers in their current position for 12 months or less, approximately one-third had no previous experience related to energy management.

From these questions it appears that, while there are many energy managers who have considerable experience with the DoD and at their current installations, there remains a not insignificant group of individuals who are relatively new to both DoD and their current positions. The level of training these individuals receive will be critical to their success as energy managers.

Finally, we examine how much longer respondents anticipate that they will work on energy issues within DoD. This measure provides an idea as to the level of commitment to the program as a professional career.

Table 3.1 shows that, surprisingly, almost 50 percent (49.7 percent) of the respondents expect that they will continue to work on energy is-

Table 3.1

Future Time as Energy Manager
(number of observations and percentage)

	Military	Civilian	Other	Total
Less than 1 year	22 (27.5%)	15 (6.9%)	5 (22.7%)	42 (13.2%)
1 to 2.99 years	19 (23.8)	40 (18.4)	2 (9.1)	61 (19.1)
3 to 4.99 years	11 (13.8)	40 (18.4)	6 (27.3)	57 (17.8)
5 plus years	28 (35.0)	123 (56.4)	9 (40.9)	160 (50.0)
Total	80 (100%)	218 (100%)	22 (100%)	320 (100%)

NOTE: Percentages are column based and may not add to 100 because of rounding.

sues within DoD for five or more years. These numbers do differ if we examine this table by military versus civilian employees. As might be expected, civilian employees anticipate working on energy issues within the DoD longer than do military personnel: Of civilian employees, 56.4 percent expect to be involved for five or more years as compared with military personnel of whom only 35 percent expect to be involved for that length of time. Over one-quarter of military personnel expect to be involved for less than a year longer, while this was the case for less than 7 percent of civilian employees.

Regardless of the length of time already in their current position, the majority of respondents expect to continue as energy manager for five or more years. This indicates that, for the most part, respondents consider energy management a career function.

TRAINING

Beyond education and work experience, the preparedness of the energy manager can be influenced by the amount of training he or she obtains while in the position. It is important to acknowledge that, beyond a certain minimum level of training, there is no "best" or "correctly" trained energy manager. Rather, an energy manager's training should be closely associated with the characteristics of the installation and the needs of that specific energy program. It is the appropriateness of training for a given situation that matters, as well as the ability of the energy manager to supplement his or her training as that situation changes.

EPAct92 defines a trained energy manager as one who has

> completed a course of study in the areas of fundamentals of building energy systems, building energy codes and applicable professional standards, energy accounting and analysis, life-cycle cost methodology, fuel supply and pricing, and instrumentation for energy surveys and audits.

This definition relates predominately to technical knowledge. However, energy management includes management-oriented activities as well, such as awareness and education programs, strategic planning, and eliciting the cooperation of other base organizations and tenants.

Training is also related to experience. The number of years an individual has been an energy manager, his or her previous work experience, and educational background also constitute a type of training contributing to the capability of an installation energy manager to implement an effective program. When examining the amount of training received while energy manager, one must keep in mind that some individuals may have been highly trained or experienced prior to assuming the position.

Over 56 percent of the energy managers in the sample did not receive any job-related training within the first six months of assuming the position. Thus, their initial energy management capabilities and effectiveness may have been somewhat lower than desired. Military energy managers tend to lack early OJT more frequently compared with those in the full sample.

For the most part, funding for training appears to be available for the majority of energy managers, though a significant number (28 percent) do not have such funding or are unaware of it. It is interesting that a statistically significant number of energy managers who did not receive training within the first six months also had funding availability issues (see Table 3.2). There are also a relatively large number of energy managers who have funds available and did not use them in the first six months to get job-related training.

Table 3.3 shows both the number of courses taken since becoming an energy manager and the number for which funding was available. On average, energy managers in the sample have taken three

Table 3.2

Funding On-The-Job Training (OJT)

	OJT Within Six Months		
Funds Available for Training	Yes	No	Total
Yes	119	110	229
No	24	64	88
Total	143	174	317

Table 3.3

Number of Courses Taken and Funding

Number of Courses Taken:	No. of Those Taking Course(s) Since Becoming Energy Manager (%)	No. of Those Taking Course(s) for Which Funding Was Available (%)
0	57 (18.8)	27 (10.4)
1	73 (24.1)	79 (30.5)
2	48 (15.84)	45 (17.4)
3	35 (11.5)	30 (11.6)
4	25 (8.25)	21 (8.1)
5	16 (5.3)	18 (6.9)
6	8 (2.6)	6 (2.32)
7	8 (2.6)	7 (2.70)
8	8 (2.6	7 (2.70)
9	5 (1.65)	2 (0.8)
10	7 (2.3)	6 (2.32)
11	1 (0.3)	3 (1.2)
12	3 (1.0)	4 (1.5)
15	5 (1.5)	1 (0.4)
16	1 (0.3)	1 (0.4)
20	1 (0.3)	1 (0.4)
24	1 (0.3)	1 (0.4)
25	1 (0.3)	1 (0.4)
Total	303 (100)	259 (100)

courses, but the distribution is very wide and sharply skewed. About 40 percent of the energy managers have taken 1 or 2 energy-related courses, while only about 5 percent have taken more than 10 over their career as energy managers. Almost 20 percent have taken no courses since assuming the responsibilities of energy managers; about half of these did have training funds available that they appar-

ently did not use.[1] There are differences between military and civilian respondents: On average, civilian energy managers have attended four courses, while military energy managers have attended one.

Funding was obtained for most courses taken: There is a 95 percent correlation between number of courses taken and number of courses for which funding was obtained. Based on the earlier results, we can presume that many of these courses were taken after the first six months of assuming the energy manager position. On average, civilian energy managers obtain funding for more courses than do military personnel (3.9 versus 1.2). Relatively more respondents whose primary duty is energy management tended to obtain funding for a higher number of courses.

The subject matter covered in courses taken by energy managers varies widely, from general overviews of federal or DoD energy policy and procedures to specific technical operations of energy, using equipment or control systems. Table 3.4 shows the number of respondents attending specific energy-related courses. The most frequently attended courses are the general policy overview, general energy management, and building energy conservation courses. Relatively few energy managers have taken recycling, alternative energy, or water conservation courses. Even the course with the highest attendance—energy policy overview—has been taken by only slightly more than one-third of the survey respondents; most courses have been taken by significantly fewer energy mangers.

The courses with the highest relative attendance—energy policy overview, general energy management, and building energy conservation—correspond to what we believe are the core courses all energy managers should take. Nevertheless, fewer than 50 percent of the total number of respondents took one of these courses, and only five energy managers attended all three.

[1]Some energy managers may not require, or may believe that they do not require, additional training, depending on both the complexity of their energy management task and their prior experience and educational background.

Table 3.4

Energy-Related Courses Taken

Energy-Related Training Course	Number of Respondents Attending
Energy policy overview	133
Certification program	72
General energy management	127
Other management programs	47
Contracting and funding techniques	88
Awareness and education	54
Utility rates and regulations	48
Building energy conservation	95
Recycling	11
Preventive maintenance	26
Heating, ventilation, and air-conditioning (HVAC) systems	63
UMCS	43
Lighting	89
Boiler efficiency	40
Motors	45
Alternative energy sources	30
Water conservation	29
Environmental management	27
Other	41

While multiple course attendance is common, there is no dominant mix or combination of courses taken; only 22 combinations were taken by two or more respondents; 4 of these were taken by three or more. It is not clear whether this result indicates that energy managers randomly select training courses, or that they tailor the courses they take to both opportunity and need. In general, we believe that course attendance is most effective as a training tool when the skills and knowledge needed to perform the energy management function are first defined, based on the energy manager's background and experience and the needs of the installation, and then appropriate courses are identified.

Table 3.5 suggests the degree to which the respondents perceive problems in certain training-related areas. Most energy managers believe that training does pose at least a small problem in terms of

Table 3.5

Potential Training-Related Problems

	Degree to Which Area is a Problem					
Potential problem area (no. of observations)	None	Very small	Small	Moderate	Large	Very large
Training adequacy (304)	40	45	49	62	61	47
Funds for training (300)	80	48	40	49	36	47
Course availability (298)	99	56	45	52	25	21
Time to train (304)	43	31	46	50	67	67

their ability to effectively manage energy resources and achieve conservation goals. There are differences of opinion among the respondents regarding the degree to which certain training-related issues pose a problem. Funds for training and the availability of courses appear to be relatively minor problems for the majority of energy managers. The adequacy of training and the availability of time to become trained are considered to be moderate to large problems for the majority of energy managers. The implication here is that many energy managers feel that their current level of training is inadequate, and that this could be enhanced if there was more time available to take courses, attend seminars, etc.

Finally, relatively few respondents (11 percent) are formally certified energy managers through the Association of Energy Engineers or similar programs. That the majority of energy managers desire to be certified indicates a desire for enhanced professionalism of the energy management function. This notion of professionalism corresponds to the finding that most energy managers expect to maintain their position for a significant length of time.

The amount and types of additional training needed will vary among energy managers and among types of installations, but some types of training may be universally helpful. In general, energy managers should be able to tailor training programs to meet their individual needs, and they require the time and funding to avail themselves of this training.

Chapter Four

PROGRAMMATIC FACTORS AFFECTING IMPLEMENTATION

The ability to execute an energy management program is affected by several categories of variables, including time spent or available and level of effort, staff size and training issues, funding availability and amounts, knowledge of conservation opportunities, and awareness and cooperation of other functions and activities at the installation. This chapter presents the survey-based data addressing these factors.

TIME AND LEVEL OF EFFORT

To execute a successful installation energy program, an energy manager must devote an adequate amount of time to critical energy management tasks. The amount of time that is adequate will be influenced by such factors as size of the installation, the installation's function, the types of energy used, number of buildings, and the number of other staff available to assist the energy manager.

According to EPAct92, each installation is required to have a full-time energy manager. However, only 25 percent of all respondents indicated that energy management was a primary responsibility. In terms of percentage of time spent on energy management functions, the mean time across all respondents is just under 28 percent. For those with energy management as a primary responsibility the mean percentage of time spent on energy management activities is 70.4 percent, and for those with energy management as an other duty, as assigned, the mean is only 14.2 percent. Clearly, energy managers with primary-duty status spend more time attending to energy management functions, but the majority do not attend to these issues on a full-time basis (only approximately 6 percent of respondents indi-

cated that they spent 100 percent of their time on energy management). Other functions that energy managers spent time on include maintenance and facilities, engineering and design, and environmental functions. On the one hand, the relatively small amount of time energy managers spend on energy management tasks is representative of the relatively low priority energy management has among DoD activities. To the extent that energy management includes cost-effective activities, this may be a critical problem in DoD installation management more generally. On the other hand, while these data indicate the importance of giving energy management primary-duty status, it may be that a particularly talented energy manager need not spend all of his or her time on energy management issues to have a successful program.

However, the time available to perform energy management functions stands out as the most important problem for energy managers. Table 4.1 shows that approximately 75 percent of energy managers view this as at least a moderately severe problem, with 40 percent indicating it to be a very large problem. As might be expected, over 80 percent of those who have energy management as an other duty indicate that it is at least a moderate problem; almost 50 percent (47.5 percent) indicate it is a large problem. In fact, even respondents whose primary duty is energy management rate this as a problem area constraining their ability to effectively manage energy resources and achieve conservation objectives. Of those with energy management as a primary responsibility, only 56 percent feel that it

Table 4.1

Time Availability As a Problem (No. of Observations)

	Primary-Duty Status	Other-Duty Status	Total
Not a problem	12 (15.0%)	9 (4.0%)	21 (6.9%)
Very small problem	9 (11.3%)	14 (6.3%)	23 (7.6%)
Small problem	14 (17.5%)	14 (6.3%)	28 (9.2%)
Moderate problem	13 (16.3%)	33 (14.8%)	46 (15.2%)
Large problem	16 (20.0%)	47 (21.1%)	63 (20.8%)
Very large problem	16 (20.0%)	106 (47.5%)	122 (40.3%)
Total	80 (100%)	223 (100%)	303 (100%)

is a moderate problem, with 20 percent indicating that it is a large problem. It appears that regardless of the commitment level, the majority of respondents believe that energy management functions require more time than is currently allotted.

Time allocation for energy managers has an additional dimension. Even when actually performing energy management functions, we must ask whether or not energy managers are spending their time on the most important tasks. To examine this issue, each respondent was asked to name the three tasks on which he or she spends the most time and the three tasks on which he or she *should* spend the most time. Table 4.2 provides a breakdown of these answers.

The energy management tasks that take up most of the energy managers' time are tracking and analysis of energy consumption, identification of energy conservation projects, reporting, and utility bills. Energy managers believe they should be spending most of their time

Table 4.2

Energy Managers' Allocation of Effort Among Activities (Percentage)

Activities	Currently spends the most time doing	Should spend the most time doing
Track/analyze energy consumption	49.8	43.6
Reporting	30.2	6.8
Utility bills	22.3	7.8
Utility forecasting	10.6	4.8
Utility metering	7.3	6.1
Awareness and education	26.6	42.4
Conduct/participate in energy working groups	16.4	10.3
Contract monitoring or negotiation	7.1	4.5
Identification of projects	35.6	60.6
Design of projects	10.6	20.3
Prepare project proposals	15.0	19.7
Oversight of project execution	10.9	10.3
Technical support for projects	10.9	12.3
Review designs for nonenergy projects	17.5	13.1
Conduct energy audits	4.8	16.4
Preventive maintenance	15.6	16.1

on identification of energy conservation projects, tracking and analysis of energy consumption, and awareness and education. While tracking consumption and identification of projects rate highly on both sides of the table, of the highest rated group, only the former seems to receive the correct allocation of time.

A review of the table suggests that there are two tasks that receive far more time than they should: formal/informal reporting (30.2 percent versus 6.8 percent) and review and/or certification of utility bills (22.3 percent versus 7.8 percent).[1] There are also four tasks that receive far less time than they should; awareness and education (26.6 percent versus 42.4 percent), identification of projects (35.6 percent versus 60.6 percent), audits (4.8 percent versus 16.4 percent), and project design (10.6 percent versus 20.3 percent). Clearly there are important concerns about the allocation of the energy manager's time even when performing energy management functions. If too much time is spent on administrative tasks, then actual time spent on technical tasks will be limited. Results suggest that this is the case for some energy management tasks.

STAFF ISSUES

If the energy manager does not have enough time to complete the necessary energy-related tasks, then there should be additional staff to assist. Especially at large installations, the energy management function has so many dimensions that it is difficult for a single individual to accomplish all that needs to be done. However, most energy managers work essentially alone, though a few have small staffs of at least part-time personnel. Over 51 percent of respondents indicate that the total number of dedicated energy management staff is one person; 85.2 percent indicate not more than two people (Figure 4.1). This trend is seen across services and for energy managers both with primary- and other-duty status.

Note that the 47 (14.5 percent) respondents who indicated that there are no dedicated energy management staff at their installation are not counting themselves. Forty of these respondents consider en-

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[1]We must remember, however, that monitoring and reporting are typical of any government function.

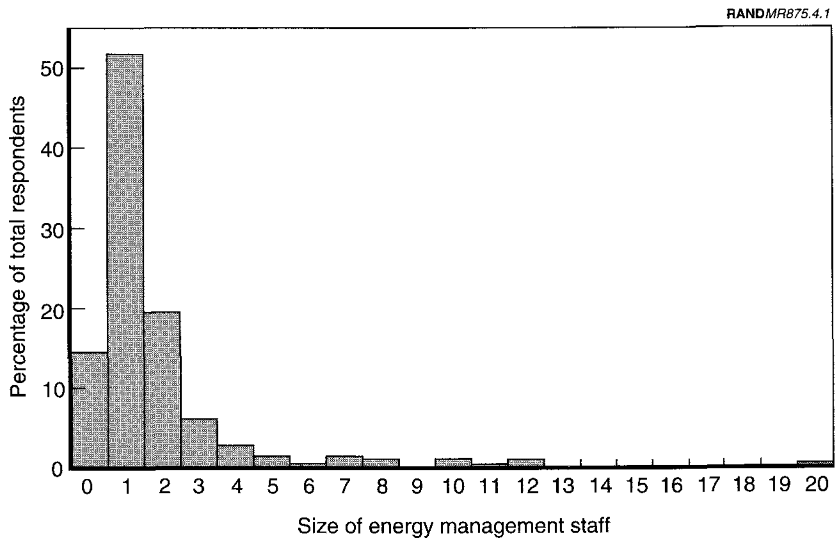

Figure 4.1—Size of Dedicated Energy Management Staff

ergy as an additional duty, and they spend 1–25 percent of their time performing energy-related functions.

Respondents see the staffing issue as a major concern for fulfilling their job requirements. In fact, energy managers rated staff size second only to time available as a problem in implementing a successful energy conservation program. Over 90 percent of respondents (90.5 percent) felt that the size of the energy management staff was a problem to some degree. Over 70 percent of the respondents (72.9 percent) felt that it was a moderate to large problem. This trend is seen across all respondents, regardless of the size of their staff. In looking at the two issues together, energy managers appear to be suggesting a trade-off between staff size and time: Increased staff size makes time less of a problem.

For those energy managers with additional staff, the level of knowledge and experience of that staff is also important. While not rated overall as a large problem, military energy managers appear to rate level of staff experience as a more severe problem than do civilian energy managers.

FUNDING ISSUES

Energy conservation project funding can potentially be obtained from a variety of DoD, service, and private sector sources, including the following:

- Operations and maintenance funds controlled by the installation. This is the most common source of funds.
- Military construction funds that are closely controlled by Congress. Any project requiring an investment of $300,000 or more is classified as a military construction project.
- Energy Conservation Investment Program (ECIP) funds are a special MILCON program. Total amounts are allocated by Congress. EED oversees the allocation of these funds among the proposals submitted.
- Energy savings funds retained at the installation. These funds are generated through prior investment in energy conservation projects.
- Shared energy savings/ESPC are third-party arrangements in which a private party makes an investment and the resulting savings are split according to an agreed upon formula.

Centrally controlled funding for energy efficiency in DoD has fluctuated significantly over time. Over the period 1977–1986, funding varied between about $75–$200 million per year (nominal dollars), with 1978 the low and 1981 the high. Funding within DoD was close to zero from 1987–1991 and did not really begin to increase until 1992.[2] In 1995, funding again began to be significantly reduced.

The energy managers in our sample each have received on average $1.2 million (then-year dollars) in funding since FY85. However, the distribution is highly skewed. Twenty-one percent of the respondents (37 out of 180) indicate that they have received no funding; 48 percent received between $3,000–$900,000; about 28 percent indicate receiving greater than $1 million since FY85. The distribution, and thus the average, is dominated by four respondents who indicate

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[2]Office of Technology Assessment, *Energy Efficiency in Federal Facilities: Update on Funding and Potential Savings*, Washington, D.C.: March 1994, p. 11, Fig. 2.

receiving between \$9–\$11 million. The differences between military and civilian energy managers are significant: Civilian energy managers received an average of \$1.5 million since FY85 and military energy managers received an average of about \$500,000.[3] Similarly, respondents who view energy management as a primary duty received \$2.5 million, on average, compared with \$700,000 for other-duty energy managers.[4] Thus, civilian energy managers who perceive energy as their primary duty appear to be more effective in obtaining funding for conservation projects.

The sources of this funding are highly variable. Table 4.3 indicates that of the six possible sources, base operations and ECIP were used most often, with FEMP very close behind. The average percentage of total funding obtained through these sources varies considerably around the mean values shown in the table. In general, some funding is available to the majority of energy managers from one or more sources.

Because of its self-renewing and discretionary nature, retained savings as a source of funds deserves further discussion. As discussed earlier, the retention of savings policy allows two-thirds of savings from conservation projects to remain on the base, half for reinvestment in the energy program and half for base morale and welfare at

Table 4.3

Source of Energy Conservation Funding

Funding Source	Number of Observations	Average Percentage Obtained Through Source
ECIP	98	42.5
Other MILCON	54	25.0
FEMP (OSD central fund)	91	46.5
Base operations	100	41.1
Retained savings	46	12.6
Other	53	46.1

NOTE: Average values include respondents who indicated "0."

[3]Significant at the 0.003 level.

[4]Significant at the 0.000 level. This difference remains significant even after dropping all respondents who indicate a "0" response.

the discretion of the base commander. Properly implemented, retained savings provide appropriate incentives to the energy manager, base commander, and base tenants.

Table 4.4 shows that only 34 (10 percent) of the energy manager respondents considered themselves to be very familiar with the retention of savings policy. However, a cumulative total of 51 percent considered themselves at least somewhat familiar. Based on the verbatim responses and other marginal notes in the survey returns, a small portion of these appeared to confuse the formal retention of savings policy with general DoD energy management policy. Unfortunately, it is not possible to sort out these respondents accurately.

Of the energy managers at least somewhat familiar with the policy, 28 indicated that they had used, or attempted to use, the policy. Of these, 9 were very familiar and 16 somewhat familiar with the retention of savings policy. An additional 144 respondents indicated that they had not used the policy; all but 9 of these indicated that they were at least somewhat familiar with it.[5]

Energy managers who were familiar with the retention of savings policy indicated a range of reasons for not making use of the policy. Table 4.5 lists the general categories of reasons, but considerable variation exists within each category. Further, many energy managers indicated more than one reason; these multiple responses are included in the general discussion below, but not in Table 4.5.

Table 4.4

Respondent Familiarity with the Retention of Savings Policy

	Frequency	Percentage	Cumulative Percentage
Familiar	34	10.5	10.5
Somewhat familiar	133	40.9	51.4
Not familiar	158	48.6	100.0

[5]Technically, those 9 should not have answered this question in the survey, but rather should have *jumped ahead* to the next section. See the survey structure.

Table 4.5

Reasons for Not Using Retention of Savings Policy

Category	Frequency	Percentage	Cumulative percentage
Policy guidance unclear	28	21.9	21.9
Other organization not participating	11	8.6	30.5
Mechanisms for implementation	17	13.3	43.6
Savings not retained	17	13.3	57.0
Time/staff constraints	8	6.3	63.3
No interest or need	8	6.3	69.5
Other	21	16.4	85.9
Nonresponsive	18	14.1	100.0
Total	128	100.0	

The lack of policy and program guidance, leading essentially to lack of policy implementation was indicated by approximately 22 percent of the respondents. This included comments that the service comptrollers had not issued guidance, lack of knowledge about the policy and how it works, or statements that services have not implemented the policy.

The lack of participation from other functions and organizations was indicated by only about 9 percent of respondents. The most common function referred to here was comptroller (which includes accounting, finance, budgeting).

The difficulty and complexity of the mechanisms needed to take advantage of the policy were also cited by about 13 percent of respondents. In particular, mechanisms for calculating and validating savings from conservation activities, and mechanisms for retaining funds earmarked for energy were cited as critical constraints on policy use.

An equal number stated a more specific problem relating to the observation that any savings generated are not retained—neither at the energy program level, nor even at the installation level. Utility budgets were often reduced by the amount saved, removing any benefit of energy conservation to the program or installation.

A relatively small number of respondents indicated that time or staff constraints, due to the relative complexity of the policy and imple-

mentation mechanisms, prevented use of the policy. A similarly small number of respondents indicated that no savings were generated from conservation activities, or there was no interest on the part of base personnel, or no need to use the policy since adequate funds were available elsewhere.

The energy manager respondents in our sample present a surprisingly balanced view of the degree to which funding-related issues represent significant problems or constraints on successfully implementing an installation energy conservation program. Table 4.6 lists several areas that were identified as potential constraints, and the distribution of responses across categories of problem severity. In most cases, 23–28 percent of respondents indicated that these funding-related issues were either very small problems or not problems at all. Similarly, about 35 percent of respondents indicated that these factors constitute problems of low or moderate severity. Around 40 percent of respondents indicated that the factors posed relatively severe constraints on implementation, a significant number. What is striking about the distribution is the similarity across factors. The exception is the retention-of-savings policy: Over 50 percent indicated that current implementation (or lack thereof) of this policy poses a relatively severe constraint on overall energy program implementation. This result reflects the perception of energy managers that retention of savings is a critical incentive for energy conservation, and also a potentially important funding source in a constrained budget environment.

INFORMATION ABOUT POTENTIAL AND PROJECTS

To effectively manage energy at an installation and execute energy conservation projects, an energy manager needs to know the scope of energy conservation potential at his or her installation and also know of opportunities available to take advantage of this potential. Energy audits represent information about the potential for conservation known to the energy manager. The various types of audits reflect quality of information. The range of resources used by the energy manager to obtain energy-related information is another indicator of the energy manager's knowledge of opportunities to initiate energy conservation projects.

Table 4.6

Severity of Funding-Related Constraints on Implementation

Factor (No. of observations)	Not a problem	Very small problem	Small problem	Moderate problem	Large problem	Very large problem
Funding from installation (296)	11.8	11.1	18.6	16.6	18.2	23.7
Funding from other sources (296)	16.6	11.5	14.2	20.6	17.6	19.6
Difficulty obtaining funds: energy mgmt (294)	13.6	12.2	15.3	18.4	18.4	22.1
Difficulty obtaining funds: energy projects (293)	13.3	11.3	16.4	17.8	18.1	23.2
Retention of savings implementation (228)	18.4	6.1	9.2	15.4	13.6	37.3

The conservation potential of an installation can be identified through various types of audits, ranging from a walk through by the energy manager or a comprehensive audit conducted by a third party. In our sample, 154 respondents indicated that at least some conservation potential had been identified, while 155 indicated that it had not. A civilian energy manager is somewhat more likely to have identified his or her installation's conservation potential, while military energy managers were somewhat less likely. The fact that half the energy managers in our sample had not identified the potential scope of energy conservation at their installations is a significant finding. Identification of potential energy conservation is the first step in a rationale allocation of scarce energy conservation funds.

Audits can focus on a specific building or type of building, or can emphasize technology classes (e.g., efficient lighting) applicable to most buildings. Computer modeling is another form of audit in which energy conservation potential of various project types are estimated, based on installation-specific input and general assump-

tions regarding the value of key parameters. An audit (or evaluation) is usually required to justify funding for an energy conservation project.

Table 4.7 indicates the type of audits that were conducted at the installations represented in our sample.[6] Low cost/no cost, personal assessment, and walk-through audits were the most common. Substantially fewer energy managers indicated that they used either centralized project identification (e.g., computer modeling run from service, major command, or functional headquarters) or software-based systems (e.g., Facility Energy Decision Screening—FEDS System). If used, most mechanisms were perceived as helpful in identifying conservation potential and project justifications.[7]

Excluding those 73 respondents who did not use any of the mechanisms listed in Table 4.7 to identify their installations' energy conservation potential, there were 112 different combinations of mechanisms used by 257 respondents. While a wide range of combinations was used, the most common include personal and tenant input (10);

Table 4.7

The Use of Audits for Identifying Energy Conservation Potential

Mechanism	Total Number Using Mechanism
Low cost/no cost	156
Building specific	129
Technical specific	74
Walk-through	131
Comprehensive	86
Centralized project identification	47
Software based	29
Personal assessment	140
Tenant input	95

[6]The audits were conducted by a variety of organizations. This information has been provided to the sponsor under separate cover.

[7]There was very little variation in the helpfulness ratings of the audit types. Generally, 80 percent or more of the respondents indicated that a particular audit type was helpful or very helpful if used.

comprehensive audit only (10); low cost/no cost only (8); low cost/no cost, walk-through, and building specific (9); and a group of 8 (mostly Army civilian primary-duty energy managers) who used all but the software mechanism.

On average, energy managers who have formally identified their installations' conservation potential did better in attaining that potential than those whose potential had not been identified: 32.7 percent versus 23.6 percent attainment.[8]

Energy managers use a wide range of resources to obtain energy management–related information (Table 4.8). Multiple resource use is common. DoE documents and journals are most frequently used, and information on specific energy products is usually obtained from the manufacturer/supplier. Service-specific documents are also a common source of information. However, there is relatively little use of state energy offices, which can be potentially valuable resources. There also seems to be relatively substantial interactions between energy managers; networking allows other energy managers to be considered as resources.

Table 4.8

Information Sources Used by Energy Managers

Resources Used to Obtain Information on Energy Management	Number of Respondents Using Given Source
DoE reports/handbooks/newsletters	240
OSD reports/handbooks/newsletters	77
Service-specific documents	155
Nongovernment documents	148
State energy office	74
Product manufacturers	173
Professional consultants	95
Other energy managers	140
Journals/books	188
Courses	155
Conferences/teleconferences	92
CCB energy disk	43
Internet/online	19

[8]Significant at the 0.019 level. This difference remains significant even after dropping all respondents who indicated a "0" response.

There is very little use of the construction criteria base (CCB) CD-ROM energy disk distributed by EED, and even less use of the Internet. These results may reflect the computer hardware available to energy managers rather than the potential usefulness of the CCB disk or the Internet.

Even though multiple sources are used to obtain energy-related information, there are no dominant patterns or combinations of sources. There are 242 different combinations used by at least one respondent, and 42 of these used by two or more. The highest number of respondents for any one resource mix combination is six energy managers who indicated use of 11 of the 13 information sources listed in Table 4.8 (all but the CCB disk and the Internet).

AWARENESS AND COOPERATION

DoD energy managers at all levels recognize that a successful program requires the cooperation and active participation of many different organizations at an installation. Depending on the specific characteristics of the installation, these organizations may include

- civil engineering/public works
- transportation
- accounting and finance/comptroller (budgeting)
- base supply
- base contracting
- public affairs
- fuel management.

Each of these organizations has a role in setting, implementing, monitoring, and enforcing an installation energy program. Personnel from these functions are required to assist the energy manager by providing specific expertise as needed: design engineering, project proposal documentation, procurement of efficient equipment and energy services, building and equipment maintenance, etc.

The awareness and support of the installation commanding officer is thought to be an important factor affecting the implementation of

energy policy. Supportive commanders can provide funding, facilitate cooperation from other base organizations, resolve conflicts, and generally increase the effectiveness of an energy manager's efforts. Table 4.9 indicates that 75 percent of installation commanding officers are at least somewhat aware of the installation energy program. Energy managers perceive the remaining 25 percent as equally split between neither aware nor unaware, or unaware of the program to some degree. The awareness of the commanding officer appears to translate into better support for the energy program in general: There is a high association between commanders who are somewhat or very aware of the installation energy program and energy managers rating command support as either a very small problem, or not a problem at all.

A ranking of the considerations that influence a commanding officer's support for the installation energy program are shown in Table 4.10. According to the energy manager respondents, commanding officers are mostly concerned with generating dollar savings from the program, a not unexpected result. Policy compliance is also ranked first for a large number of commanding officers. Environmental and energy savings considerations play a less important role in influencing command support, demonstrated both by the higher number of lower rankings and the lower total number of respondents who indicated any ranking at all. While most energy managers perceived their commanding officer as influenced to some degree by all four categories, some respondents indicated only a single influential factor, usually dollar savings. Not surprisingly,

Table 4.9

Respondents' Reports of Commanding Officer's Awareness of Energy Program

Commanding Officer Awareness of Program	No. of observations	Percentage	(Cumulative percentage)
Very aware	91	28.3	(28.3)
Somewhat aware	152	47.2	(75.5)
Neither	39	12.1	(87.6)
Somewhat unaware	19	5.9	(93.5)
Very unaware	21	6.5	(100.0)
Total	322	100.0	

Table 4.10

Respondents' Reports of Considerations Affecting Commanding Officer's Support

Ranking	Energy Savings	Policy Compliance	Dollar Savings	Environmental Concerns
1	39	111	169	25
2	28	78	80	46
3	57	52	25	76
4	93	20	7	63
5	4	1	2	3
6	1			
Total	222	262	283	213

given its lack of mission priority, energy conservation for its own sake generates little command support. However, if the commander is very interested in obtaining savings, one might expect a relatively higher awareness of the energy program. A cross-tabulation of commander awareness and the factors considered in influencing support shows no relationship.

The location of the energy management function within the institutional structure of the installation can potentially affect an energy manager's ability to obtain cooperation and support from the other base activities and functions needed to execute an energy conservation program, as well as influence the behavior of base tenants. Table 4.11 shows the installation organization in which the energy management function is currently housed, as well as the organization in which the respondents believe the function should be located.

Not unexpectedly, the majority of energy managers are based out of the engineering or facilities organizations on base. These functions are usually part of the public works or civil engineering organizations. Significantly fewer respondents are based out of logistics, environmental, or maintenance organizations.

The striking conclusion from Table 4.11 is that, on average, energy managers are satisfied with their current organizational location. This is not necessarily the case at the more detailed level, however. While 57 percent of respondents indicated no change in preferred organizational location, 43 percent indicated that they believe a dif-

Table 4.11

Organizational Location of Energy Management Function

Organizational Location of Energy Management Function	No. of Those in Current Organizations (percentage)	Respondents Choosing This Location As Best
Logistics	11 (3.4%)	9 (2.8%)
Environmental	16 (5.0%)	17 (5.3%)
Utilities	16 (5.0%)	24 (7.5%)
Engineering	79 (24.7%)	67 (21.0%)
Maintenance	38 (11.9%)	22 (6.9%)
Facilities	105 (32.8%)	107 (33.5%)
Other engineering	38 (11.9%)	23 (7.2%)
Command staff	4 (1.2%)	37 (11.6%)
Other	13 (4.0%)	13 (4.0%)
Total	320 (100.0%)	319(100.0%)

ferent home for the energy management function would facilitate performance of those duties. The majority of respondents currently part of the environmental and logistics organizations believe that they would be more effective in some other organization, though there is no pattern to the alternative choice. A significant number of respondents from all categories believe that being part of the command staff would be the most effective organizational location.

Some aspects of awareness and cooperation are considered to be constraints on effective implementation by a significant number of respondents. Table 4.12 lists several factors related to the awareness and cooperation of installation individuals, activities, and tenants. Over 50 percent of respondents consider support from the base commanding officer and their next higher command to be either very small problems or not a problem at all. Only about 18 percent of respondents consider command support a relatively severe constraint on implementation.

Approximately 30 percent of the respondents consider the support of base tenants a severe problem, and an additional 23 percent consider this a moderate problem. Since energy conservation cannot be achieved without some cooperation from base tenants (even with technical fixes implemented), this factor is worth considering. Similarly, the energy manager's lack of ability to provide strong incentives

Table 4.12

Severity of Cooperation-Related Constraints on Implementation (in percentage)

Factor (No. of observations)	Not a problem	Very small problem	Small problem	Moderate problem	Large problem	Very large problem
Support from next higher command (297)	34.3	17.5	15.8	12.5	12.5	7.4
Support of base commander (293)	32.8	19.8	17.1	12.0	10.6	7.9
Support of base tenants (291)	12.0	15.8	18.9	23.0	13.8	16.5
Cooperation from other functions (291)	24.7	18.2	21.0	17.9	6.9	11.3
Lack of incentives (299)	5.7	8.4	15.7	21.4	19.7	29.1
Military family housing (252)	43.7	6.0	6.8	11.1	11.5	21.0
Organizational location of energy function (298)	35.9	16.4	12.1	10.7	11.4	13.4

for conservation is considered a constraint by about 48 percent of respondents, with another 21 percent indicating this as a moderate problem.

Despite some anecdotal evidence to the contrary, the energy manager's ability to affect military family housing does not appear to be a problem for most energy managers. However, 21 percent of the respondents did indicate that this is a severe constraint. For bases with large housing complexes, energy consumption in military family housing can be a significant part of total base consumption and energy costs.

On average, obtaining the cooperation of the other installation activities required to properly implement energy projects—contracting, comptroller, civil engineering, etc.—appears to be only a moderate constraint on program implementation.

Corresponding to the results presented earlier, the organizational location of the energy management function is not perceived as a significant problem by the majority of respondents.

Chapter Five

CONCLUSIONS AND RECOMMENDATIONS

SUMMARY OF RESULTS

Implementation of an energy program within the DoD is a challenging task in a number of dimensions. First, the scope of energy consumption is very broad and includes residential, commercial, and industrial categories and a wide range of energy types. Second, each installation is characterized by a unique set of economic, mission, and physical characteristics, making standardization difficult and often inappropriate. Lastly, energy conservation in DoD is not a primary mission objective and so receives less attention and resources than might be desirable.

DoD has made substantial progress toward achieving facility energy conservation goals and effective management. Our results indicate the following:

- A 12 percent reduction in energy use per square foot had been attained by 1994. Thus, while some progress has been made, an additional 18 percentage point reduction is required by 2005; the average annual reduction in energy use will have to increase over previous years to achieve mandated goals.
- Only 50 percent of energy managers indicated that they had identified the conservation potential at their installations. Of the identified energy conservation potential at DoD installations, energy managers believe that 30 percent had been attained by 1995.

- Sixty-five percent of energy managers believe that their programs have been at least somewhat successful in saving energy. Sixty-one percent of energy managers believe that their programs have been at least somewhat successful in achieving energy conservation goals. However, energy managers feel that their programs have been relatively less effective in providing incentives to change behavior and in gaining the cooperation of other base functions and activities. These are two important intermediate implementation goals in which performance appears to be less than desired.
- Sixty percent of energy managers believe that they will achieve the conservation goal of a 30 percent reduction in energy use per square foot by 2005 (1985 baseline). Sixty-seven percent of energy managers believe that they will have identified all projects with paybacks of less than 10 years. However, a substantial number of energy managers anticipate achieving only one or the other goal, and 22 percent of the respondents do not expect to achieve either goal.
- Most energy managers in our survey define their functions fairly broadly and include a number of specific activities in performing energy management duties. Over 55 percent include nine or more activities, such as energy trends analysis, project identification and design, awareness and education programs, energy audits, and preventive maintenance. Specific responsibilities are tailored to the characteristics of the installation.
- Similarly, most energy programs include multiple projects (lighting, HVAC, awareness, metering, etc.). Lighting, awareness and education, building metering, and equipment modernization and replacement are the project areas most frequently cited as developed and implemented by energy managers and are the core of an energy program. The relatively small difference between developed and implemented projects indicates some success. Again, the mix of specific projects is tailored to the characteristics of the installation.

Despite some real and perceived success, there remains considerable scope for improvement.

To a large extent, the success of DoD's energy program to date is due to the high quality of the installation energy management cohort. As a group, energy managers are well educated in appropriate backgrounds, reasonably experienced in both how DoD works and the energy management function, and they define energy management in terms broad enough to include both managerial and technical elements. The fact that a majority would like to become formally certified energy managers and are planning on remaining in the energy management position for five or more years suggests a professionalism in the current cohort of energy managers that positively influences energy program implementation success and outcomes.

Energy manager training appears to be just short of adequate. While the majority of energy managers have had some relevant training, relatively few energy managers have had the three core courses we believe provide the minimum foundation for effective implementation of an energy program: policy overview, general techniques of energy management, and building energy conservation. While funding appears to be a constraint in a relatively few cases, the availability of time to take courses appears to be a more widespread and serious constraint.

Sixty-eight percent of our energy manager respondents are civilian employees of DoD. Civilian personnel tend to remain in their jobs for longer periods of time and follow a more narrowly defined career path than do military energy managers. Thus, the previous work experience of civilians is more likely to be relevant to energy management than that of military personnel. They are more likely to be committed to energy management as a profession and thus pursue energy management–related training. Our results also indicate that civilian energy managers are more likely to consider energy as their primary duty, and they are more effective at obtaining funding for energy projects.

DoD managers are also generally well educated; 77 percent have bachelor degrees or higher. Most energy managers have an educational background in engineering (42 percent), although a substantial number (19 percent) have management degrees.

The mean time spent as energy manager was just under 4 years, and the median time was 2.75 years. However, the distribution is heavily

skewed, with over 20 percent of energy managers having been in their current position for only 1 year or less. Of these, approximately one-third had no additional experience that is related energy management. Thus, while there are many energy managers who have considerable experience with the DoD and at their current installations, there remains a not insignificant group who are relatively new to both DoD and their current positions.

Some programmatic factors appear to pose significant constraints on the effectiveness of energy program implementation. Time available for performing the energy management function stands out as the most serious problem identified by our energy manager respondents. Over 75 percent believe that time availability is seriously impeding their effectiveness. Additionally, the time they do spend is not allocated efficiently among the various tasks of energy management. In particular, too much time is spent on utility bills and reporting, while too little time is spend on project identification, project design, auditing, and awareness and education.

Respondents see the staffing issue as a major concern for fulfilling their job requirements. In fact, energy managers rated staff size second only to time available as a problem in implementing a successful energy conservation program. Over 70 percent of the respondents felt that it was a moderate to large problem.

On funding-related issues, the respondents are equally distributed across the spectrum from no funding problems to funding as a severe constraint. For most energy managers, funding appears to be available from one or more sources. Retained savings is a funding source that could make a significant difference in that it is theoretically internal to the energy program; however, this policy has not been successfully implemented and is thus making little contribution to the overall funding base.

Command support does not appear to be a severe problem. Seventy-five percent of energy managers believe that their commander is at least somewhat aware of the energy program. To some extent, awareness does translate into support, but the relationship is not necessarily strong. The largest problem in this category of factors is the apparent inability of energy managers to affect in a meaningful

way the energy consumption incentives facing base tenants and activities.

Table 5.1 lists five additional factors not addressed elsewhere and the energy managers' ranking of the degree to which a factor is a problem. Most respondents indicated that clarity of DoD policy, tradeoffs or resource competition with environmental compliance, and relationships with the local utility do not pose much of a problem. However, both the lack of preventive maintenance and lack of building metering are identified as significant factors affecting effective implementation.

The range of reasons for not achieving energy conservation goals reflects the problems and constraints facing energy managers. The reasons fall into several categories, although the specific responses within each category varied somewhat. Energy managers usually provided more than one reason. For the most part, respondents did not distinguish between the two formal conservation goals (30 percent reduction, implementing projects with payback of less than 10 years); responses tended to apply to both.

There were two dominant response categories. The first concerned resources—staff, dollars, and time. Many energy managers perceive a resource shortfall in one or more of these areas, resulting in an inability to achieve energy conservation goals. Shortfalls in time or

Table 5.1

Severity of Other Constraints on Implementation

Factor (No. of observations)	Not a Problem	Very Small Problem	Small Problem	Moderate Problem	Large Problem	Very Large Problem
Clarity of DoD energy policy (297)	25.0	18.5	19.9	19.2	11.8	5.7
Environmental compliance (284)	46.8	20.4	15.9	12.3	2.1	2.5
Lack of preventive maintenance (295)	15.9	9.5	13.2	20.3	16.3	24.8
Lack of bldg metering (302)	15.6	11.6	15.6	17.2	15.2	24.8
Relationship with utility (297)	63.6	17.2	9.8	5.4	3.4	0.7

staff constrain an energy manager's ability to identify conservation projects, especially at large installations. Funding shortfalls constrain the number of identified projects that can be implemented.

Baseline-related issues was the second most common reason for not achieving conservation goals. Specific responses here included the fact that substantial progress was made prior to 1985, thus reducing the scope for further improvement; inaccurate or nonexistent 1985 baselines; and changes in workload, operating tempo, mission, and base population. This set of factors tends to be outside the normal influence of installation energy managers.

A number of energy managers also feel that the complex nature of energy consumption constrains their ability to achieve conservation goals. This includes the geographic dispersion of facilities, changes in energy type mix, and the difficulty involved in changing the behavior of consumers.

The strict cost-effectiveness guidelines also constrain a number of installations in identifying conservation projects. This is especially true for installations with relatively low electricity rates (or other energy costs), making many projects not economically viable in the 10-year time frame.

The lack of interest and support from base command and tenants affects some installations. Energy managers usually tied this back to the incentive problem raised earlier; consumers are not accountable for energy costs and savings do not directly benefit them.

IMPLICATIONS AND RECOMMENDATIONS

Energy management philosophy is multidimensional in nature. Energy managers describe a wide range of energy management philosophies, often mixing statements of goals and approaches or styles of management. In many cases, multiple goals and/or multiple approaches were indicated. Almost all philosophy statements include the caveat "without adversely affecting mission capability" or quality of life or productivity. This suggests an awareness among energy managers that energy conservation–related activities are not the primary missions and should not lead to conflicts with or compromise the primary mission.

Three categories of goals were indicated. The most common was to increase energy use efficiency in some manner. This was expressed most often through variations on the themes of cost or consumption reduction for a given activity, technical (equipment) efficiency, or the effective use of resources. Waste or pollution prevention were sometimes mentioned as objectives under an efficiency improvement goal. The other two goals can be considered subsets of efficiency: saving dollars and saving energy. These are more narrowly focused goals that relate more to outcomes than to the process of managing energy resources.

There were some interesting distinctions in management approaches indicated.

- One approach emphasizes integration of energy conservation into installation activities, including strategic planning. This approach recognized both individual and organizational responsibility to conserve energy resources.
- A second approach focused on the use of technology to achieve efficiency improvements, downplaying energy awareness and the need for behavioral changes from consumers.
- Alternatively, some approaches focused on behavioral changes, through awareness and training programs for base personnel and making energy users accountable for energy use.
- A significant number of energy managers combined both technology and behavioral emphases, even though these seem to be polar extremes.
- Some energy managers simply emphasized technical or task-oriented processes, such as complying with regulations or directives, tracking and reporting use, or controlling HVAC and lights.

Approximately equal numbers of energy managers adopted each of these approaches: No dominant approach was indicated. The energy management philosophy and approach adopted at an installation should be appropriate to the needs and characteristics of that installation.

The range of suggestions to improve the performance of installation energy programs reflects the range of problems and constraints ex-

perienced by the energy managers. Most energy managers made several specific suggestions, reflecting the fact that no single action will resolve all identified issues.

Increased use of metering, audits, and EMCS were identified as ways to improve the effectiveness of energy managers. The notion here is that an improved ability to measure energy consumption and identify areas for improvement would enhance program effectiveness. Improved measurement and monitoring capability also enhances feedback to energy users, and facilitates use of retention of savings, DSM, or ESPC strategies.

Establishing effective incentives for energy consumers was another common theme. The types of incentives needed are both positive (rewards for saving) and negative (penalties for noncompliance). In either case, the goal of the incentive program should be to make consumers more aware of, and accountable for, their energy consuming actions.

Improving energy awareness, education, and training was a frequent suggestion. Here, the focus was mostly on educating and training base personnel (functional organizations and base tenants).

It is interesting that funding-related actions were only the third most common category of suggestions for improving the energy management program. Respondents in this category mostly indicated that more funding for projects was needed, although some specified that funding for more energy management personnel or retention of savings was required.

Time-related suggestions were the most frequent category of suggestions. There were really two types of responses in this category, about equally represented. First, more time was required to carry out the functions of energy management effectively. At the least, energy management should be a primary duty. Second, a dedicated, knowledgeable staff supporting the energy manager is needed to enhance the overall effectiveness of installation energy programs and DoD's ability to achieve conservation goals. Energy managers appear to recognize an explicit trade-off between time available to perform the energy management function and staff support in performing that function. Again, this result corresponds to time avail-

ability and staff size factors identified as problem areas by a large proportion of energy managers.

Improved organizational support for the energy management function was the second most common suggestion for increasing the effectiveness of the energy program. Specific responses in this category included increased command support (the most frequent suggestion), moving the energy management function to the command staff, and improved cooperation from other base functions (contracting, comptroller, civil engineering, facilities, and maintenance). This set of suggestions addresses the critical organizational challenge facing many energy managers: The energy management function is buried deep within the installation hierarchy, the energy manager has no direct influence over energy users, and energy conservation is not a primary mission of DoD. Increased support, particularly from base commanders, major command officials, and senior decisionmakers at component headquarters would enhance the ability of installation energy managers to execute effective conservation programs.

Appendix
SURVEY OF ENERGY MANAGERS

The following is a copy of the questionnaire sent to DoD installation energy managers.

CARD 01 5-6/

A
8/2/95

Survey of Energy Managers

1-4/

> For the purpose of this study, we define the installation Energy Manager as the person who is responsible for the energy management function at this installation.

Please do not use acronyms when completing this questionnaire. Please seal your completed questionnaire in the prepaid envelope provided and return it to RAND.

If you have any questions, please call:

Jeff Drezner
Project Leader
RAND
(310) 393-0411, ext. 7101

CONFIDENTIALITY STATEMENT

This survey is completely voluntary. You may skip any items that you do not wish to answer. We will treat all information that would permit identification of any person as strictly confidential. We will use the information only for the purposes of this study and will not disclose or release information that identifies you for any other purposes without your prior consent, except as required by law.

Survey responses will be linked with energy use data obtained from the installations. We have requested your name and other contact information so that we can reach you if we need to clarify some of your comments, get added insights, or want feedback on the questionnaire itself. When the project is completed, we will destroy the identifying information. Information will not be available to higher level staff except as averages and summary statistics. We will make an updated list of all facility Energy Managers available to the Directorate of Energy and Engineering, Office of the Assistant Secretary of Defense, Economic Security; however, that office will not know who did and did not respond to the questionnaire.

Thank you for taking part in this important study.

CARD 01

1

RESPONDENT INFORMATION

____
LAST NAME *FIRST NAME* *MI*

____
TITLE/ AREA OF COGNIZANCE

COMPLETE MAILING ADDRESS

____

____

____

____
CITY *STATE* *ZIP CODE*

BUSINESS TELEPHONE # ( )________________ EXT. ______

FAX # ( )________________ EXT. ______

2

DoDAAC INFORMATION

According to our records you are the energy manager for the following Defense Activity Address Codes (DoDAACs). Please review this list carefully and cross out any DoDAACs that are not your responsibility.

If you only report energy information in the DUERS for a DoDAAC and someone else manages energy at that DoDAAC, please cross it out. We are only interested in the DoDAACs for which you *manage* energy (regardless whether or not you report it in the DUERS).

INSERT LIST

Please list any additional DoDAACs for which you manage energy that are not included in the list above.

CARD 02 5-6/
1-4/

3

BACKGROUND

1. Are you currently a member or civilian employee of one of the U.S. Armed Forces (Army, Navy, Marine Corps, Air Force) or a Defense Agency?

(Circle One)

Military 1 7/

Civilian employee of DoD 2

Other 3

Please specify: ___________ 8/

2. In which service do you work?

(Circle One)

Army 1 9/

Navy 2

Marine Corps 3

Air Force 4

Defense Agency 5

Other 6

Please specify: ___________ 10/

3. What is your rank or GS designation?

Please specify (please do not use acronyms): ______________________________ 11-12/

4. How many years have you been employed by the DoD? In your answer, please include both time spent in active federal military service and time employed as a civilian.

YEARS [ ][ ] MONTHS [ ][ ] 13-14/
15-16/

CARD 02

4

5. In your own words, please briefly describe your philosophy of energy management.

____ 17-18/

____

____

____

____

6. How long have you been energy manager at this installation?

YEARS [|] MONTHS [|] 19-20/ 21-22/

7. Prior to becoming energy manager at this installation, what other positions have you held? Please list your current position, the three immediately preceding, and then indicate approximately how long you held each position. Please do not use acronyms.

	Approximately how long did you hold this position?	
Current position: ______________________	[|] YRs	23-24/ 25-26/
Most recent position: ______________________	[|] YRs	27-28/ 29-30/
2nd most recent position: ______________________	[|] YRs	31-32/ 33-34/
3rd most recent position: ______________________	[|] YRs	35-36/ 37-38/

CARD 02

5

8. How much longer do you expect to be working on energy management issues within DoD?

(Circle One)

Less than 1 year............	1	*39/*
1 - less than 3 years......	2	
3 - less than 5 years......	3	
5 or more years.............	4	

ROLES AND RESPONSIBILITIES

9. Is energy management your primary responsibility or is it an "other duty as assigned"?

(Circle One)

Primary responsibility	1	*40/*
Other duty assigned	2	

10. What percent of your time is currently spent on each of the following functions?

Energy management or conservation	___ %	*41-43/*
Other (please specify)	___ %	*44-46/*
______________________________		*47-48/*
______________________________ TOTAL	100%	

CARD 02

CARD 03 5-6/
1-4/

6

11a. Which of the following are *your* specific responsibilities related to **energy management functions** at this installation.

	Which Are Your Responsibilities? (Circle All That Apply)	
Tracking and/or analysis of energy consumption	01	7-8/
Formal/informal reporting (e.g., DUERS, MicroEAR, briefings)	02	9-10/
Review and/or certification of utility bills	03	11-12/
Utility forecasting and projecting	04	13-14/
Utility metering	05	15-16/
Energy awareness and education programs	06	17-18/
Conduct or participate in meetings of oversight and/or energy working groups	07	19-20/
Contract monitoring and/or negotiation (e.g., ESPC, DSM, ESCO)	08	21-22/
Identification of energy conservation projects and activities	09	23-24/
Design of energy conservation projects and activities	10	25-26/
Preparation of proposals for project and activity funding (e.g., ECIP)	11	27-28/
Oversight of energy conservation project execution	12	29-30/
Technical support of energy conservation projects	13	31-32/
Review designs and specifications for non-energy conservation projects (new construction, retrofit)	14	33-34/
Conduct energy engineering audits	15	35-36/
Preventive maintenance inspection of equipment and facilities	16	37-38/
Other (please specify)	17	39-40/
______________________		41-42/

11b. From the categories above, please rank the three responsibilities that you feel are the most important for energy management. Please use the number codes given above.

(Most important) 1. [ ][ ]   2. [ ][ ]   (3rd most important) 3. [ ][ ]   43-44/ 45-46/ 47-48/

11c. From the categories above, please rank the three responsibilities that you spend the most time doing. Please use the number codes given above.

(Most amount of time) 1. [ ][ ]   2. [ ][ ]   (3rd most amount of time) 3. [ ][ ]   49-50/ 51-52/ 53-54/

11d. From the categories above, please rank the three responsibilities you think you **should** be spending the most amount of time doing. Please use the number codes given above.

(Most amount of time) 1. [ ][ ]   2. [ ][ ]   (3rd most amount of time) 3. [ ][ ]   55-56/ 57-58/ 59-60/

CARD 03

7

12. Over what other tasks would you like to have influence to make your job easier?

____ 61-62/

____

____

____

____

13. Including yourself, how many dedicated full or part-time energy management staff are at your installation? Please do not include building energy monitors in your estimate.

TOTAL NUMBER OF DEDICATED
ENERGY MANAGEMENT STAFF [ ][ ][ ] 63-65/

14. According to your installation's organizational chart, in what part of the organization is the energy management function currently located?

(Circle One)

Logistics (Supply) 1 66/

Engineering (PWC, Base, Civil):

Environmental 2

Utilities 3

Engineering/Design 4

Maintenance 5

Facilities Management 6

Other (please specify) 7

______________________ 67-68/

Command Staff Organization 8

Other (please specify) 9

__________________________ 69-70/

CARD 03

CARD 04 5-6/
1-4/

8

15. In what part of the organization do you think the energy management function **should** be located?

(Circle One)

Logistics (Supply) 1 7/

Engineering (PWC, Base, Civil):

Environmental 2

Utilities 3

Engineering/Design 4

Maintenance 5

Facilities Management 6

Other (please specify) 7

____________________ 8-9/

Command Staff Organization 8

Other (please specify) 9

____________________ 10-11/

TRAINING

16. What is the highest academic degree you have ever received?

(Circle One)

High school/GED 1 12/

Trade school/military technical training degree/certificate 2

Associates degree 3

Bachelors degree 4

Masters degree 5

PhD 6

17. In what field was this degree or certificate?

(Circle One)

Environmental 1 13/

Trade/technical field (e.g., electrician, mechanic) 2

Mechanical engineering 3

Electrical engineering 4

Management/administration 5

Other (please specify) 6

____________________ 14-15/

CARD 04

9

18. Are you a certified energy manager as defined by the Association of Energy Engineers (AEE) or a similar organization?

(Circle One)

Yes 1 16/

No 2

19. Did you receive any job specific training within 6 months of assuming the position of energy manager?

(Circle One)

Yes 1 17/

No 2

20. Is funding available for you to attend energy or management related courses or training programs?

(Circle One)

Yes 1 18/

No 2

21. Since assuming this position, how many energy or management related courses or training programs have you attended?

COURSES/TRAINING PROGRAMS [|] 19-20/

NONE .... 00 (GO TO 24)

22. For how many of these energy or management related courses or training programs did you receive funding to attend?

RECEIVED FUNDING FOR [|] 21-22/

CARD 04

10

23. Please indicate which, if any, of the following professional courses you have attended, how helpful each was, and who offered the course. Please do not use acronyms.

	Please Check If Attended	If attended, how helpful? (Circle One On Each Line) Very Helpful	Somewhat Helpful	Neither	Somewhat Unhelpful	Very Unhelpful	Who Offered This Course?	
a. Overview of energy policies, regulations, and procedures (DoD, Federal, Service).......	☐	1	2	3	4	5	________	23/ 24/ 25-26/
b. Certification program for energy managers	☐	1	2	3	4	5	________	27/ 28/ 29-30/
c. General energy management	☐	1	2	3	4	5	________	31/ 32/ 33-34/
d. Other management programs	☐	1	2	3	4	5	________	35/ 36/ 37-38/
e. Contracting and funding techniques (e.g., Life-cycle costing, DSM, ESPC, etc.)	☐	1	2	3	4	5	________	39/ 40/ 41-42/
f. Energy awareness and education programs ..	☐	1	2	3	4	5	________	43/ 44/ 45-46/
g. Utility rates & regulations................	☐	1	2	3	4	5	________	47/ 48/ 49-50/
h. Energy conservation in buildings	☐	1	2	3	4	5	________	51/ 52/ 53-54/
i. Recycling..................	☐	1	2	3	4	5	________	55/ 56/ 57-58/

CARD 04

11

Card 05 5-6/
1-4/

If attended, how helpful?
(Circle One On Each Line)

		Please Check If Attended	Very Helpful	Somewhat Helpful	Neither	Somewhat Unhelpful	Very Unhelpful	Who Offered This Course?	
									7/
j.	Preventive maintenance............	☐	1	2	3	4	5	______	8/ 9-10/
								______	11/
k.	HVAC systems	☐	1	2	3	4	5	______	12/ 13-14/
								______	
l.	Utility Management Control Systems (UMCS/Direct Digital Control System)	☐	1	2	3	4	5	______	15/ 16/ 17-18/
								______	19/
m.	Lighting......................	☐	1	2	3	4	5	______	20/ 21-22/
								______	23/
n.	Boiler efficiency	☐	1	2	3	4	5	______	24/ 25-26/
								______	27/
o.	Motors	☐	1	2	3	4	5	______	28/ 29-30/
								______	31/
p.	Alternative energy sources......................	☐	1	2	3	4	5	______	32/ 33-34/
								______	35/
q.	Water conservation ...	☐	1	2	3	4	5	______	36/ 37-38/
								______	39/
r.	Environmental management	☐	1	2	3	4	5	______	40/ 41-42/
								______	
s.	Other (please specify)								43-44/ 45/
	______________	☐	1	2	3	4	5	______	46/ 47-48/
								______	49-50/
	______________	☐	1	2	3	4	5	______	51/ 52/
								______	53-54/

CARD 05

12

CARD 06 5-6/ 1-4/

24. Which of the following courses would you attend, or reattend if you've taken this type of course before, if given the opportunity? Please include any additional courses or topics you'd like to see offered under the "Other" option.

(Circle All That Apply)

a.	Overview of energy policies, regulations, and procedures (Federal, DoD, Service)	01	7-8/
b.	Certification program for energy managers	02	9-10/
c.	General energy management	03	11-12/
d.	Other management programs	04	13-14/
e.	Contracting and funding techniques (e.g., DSM, ESPC, Life-cycle Costing, etc.)	05	15-16/
f.	Energy awareness and education programs	06	17-18/
g.	Utility rates & regulations	07	19-20/
h.	Energy conservation in buildings	08	21-22/
i.	Recycling	09	23-24/
j.	Preventive maintenance	10	25-26/
k.	HVAC systems	11	27-28/
l.	Utility Management Control Systems (UMCS/ Direct Digital Control System)	12	29-30/
m.	Lighting	13	31-32/
n.	Boiler efficiency	14	33-34/
o.	Motors	15	35-36/
p.	Alternative energy sources	16	37-38/
q.	Water conservation	17	39-40/
r.	Environmental management	18	41-42/
s.	Other (please specify)	19	43-44/

______________________________ 45-46/

____

25. Which of the following do you prefer?

(Circle One)

Off-site training	1	47/
On-site training	2	

CARD 06

26. Please indicate how useful each of the following formats is for **managerial** training.

(Circle One On Each Line)

	Very Useful	Somewhat Useful	Neither	Somewhat Unuseful	Very Unuseful	
a. Workshops/seminars.........	1	2	3	4	5	*48/*
b. Academic courses.............	1	2	3	4	5	*49/*
c. Self-study (e.g. handbooks, software, etc.)....................	1	2	3	4	5	*50/*
d. Teleconferences	1	2	3	4	5	*51/*
e. Base training/learning resource center	1	2	3	4	5	*52/*
f. Other formats (please specify)						
________________	1	2	3	4	5	*53-54/ 55/*
________________	1	2	3	4	5	*56-57/ 58/*

27. Please indicate how useful each of the following formats is for **technical** training.

(Circle One On Each Line)

	Very Useful	Somewhat Useful	Neither	Somewhat Unuseful	Very Unuseful	
a. Workshops/seminars.........	1	2	3	4	5	*59/*
b. Academic courses.............	1	2	3	4	5	*60/*
c. Self-study (e.g. handbooks, software, etc.)....................	1	2	3	4	5	*61/*
d. Teleconferences	1	2	3	4	5	*62/*
e. Base training/learning resource center	1	2	3	4	5	*63/*
f. Other formats (please specify)						
________________	1	2	3	4	5	*64-65/ 66/*
________________	1	2	3	4	5	*67-68/ 69/*

CARD 06

CARD 07 5-6/
1-4/

14

28. What resources do you use to obtain information on energy management?

(Circle All That Apply)

DoE reports/handbooks/newsletters	01	7-8/
OSD reports/handbooks/newsletters	02	9-10/
Service specific reports/handbooks/newsletters	03	11-12/
Non-government reports/handbooks/newsletters	04	13-14/
State energy office	05	15-16/
Product manufacturers/suppliers	06	17-18/
Professional consultants	07	19-20/
Other energy managers	08	21-22/
Journals/magazines/books	09	23-24/
Courses	10	25-26/
Conferences/teleconferences	11	27-28/
CCB Energy Disk (CD-ROM)	12	29-30/
Internet/On-line information	13	31-32/
Other (please specify)	14	33-34/
______________________		35-36/

29. What tools do you find particularly useful in managing energy (i.e., UMCS, special application software, databases, audits, metering)? If you use a particularly helpful product, please specify the product's name.

____ 37-38/

____

____

____

CARD 07

15

PROGRAMS AND FUNDING

30. How aware is your commanding officer of your energy management program?

(Circle One)

Very aware	1	39/
Somewhat aware	2	
Neither aware or unaware	3	
Somewhat unaware	4	
Very unaware	5	

31. In your opinion, what considerations influence your commanding officer's support for the energy management program? Please rank all that apply in order of importance.

(Please Rank All That Apply)

Energy conservation for it's own sake	☐	40/
Policy compliance	☐	41/
Dollar savings	☐	42/
Environmental concerns	☐	43/
Other (please specify):		
______________________	☐	44-45/ 46/
______________________	☐	47-48/ 49/

32. Has your installation's energy conservation potential been identified?

(Circle One)

Yes	1	50/
No	2	

CARD 07

16

Card 08 5-6/
1-4/

33. Please indicate which of the following mechanisms have been used in the process of identifying the energy conservation potential of your installation and indicate how helpful each was. Where applicable, please specify what organization performed audits or evaluations.

DEFINITIONS OF ENERGY AUDITS

Low cost/no cost: An audit of an installation at a level of detail that identifies easily accomplished projects requiring little or no investment with near term payback.
Building specific: An audit that focuses on a single building or type of building at an installation to evaluate all potential projects.
Technical specific: An audit that focuses on a single technology at an installation.
Walk through: A technical evaluation of the whole installation to identify simple prescriptive projects and the need for additional audits.
Comprehensive: An audit of an installation at a level of detail necessary to quantify all energy and water usage and identify conservation projects with pay back in less than 10 years. This audit includes project justifications.

	Please Check If Used	If used, how helpful? (Circle One on Each Line) Very Helpful	Somewhat Helpful	Neither	Somewhat Unhelpful	Very Unhelpful	What organization performed this audit/ evaluation? Please do not use acronyms.	
a. Low cost/no cost energy audit...........	☐	1	2	3	4	5	____________	7/ 8/ 9-10/
b. Building specific energy audit...........	☐	1	2	3	4	5	____________	11/ 12/ 13-14/
c. Technical specific energy audit...........	☐	1	2	3	4	5	____________	15/ 16/ 17-18/
d. Walk through energy audit...........	☐	1	2	3	4	5	____________	19/ 20/ 21-22/
e. Comprehensive energy audit...........	☐	1	2	3	4	5	____________	23/ 24/ 25-26/
f. Centralized potential project identification (e.g. REEP)............	☐	1	2	3	4	5	____________	27/ 28/ 29-30/
g. Software based (e.g. FEDS 1 or 2)..	☐	1	2	3	4	5	____________	31/ 32/ 33-34/
h. Personal assessment............	☐	1	2	3	4	5	N/A	35/ 36/
i. Input from base tenants....................	☐	1	2	3	4	5	N/A	37/ 38/
Other (please specify):								39-40/
j. ____________	☐	1	2	3	4	5	____________	41/ 42/ 43-44/
k. ____________	☐	1	2	3	4	5	____________	45-46/ 47/ 48/ 49-50/

CARD 08

17

CARD 09 5-6/
1-4/

34. Of the total energy conservation potential identified by these mechanisms, what percent of the potential has been attained?

[ ][ ][ ] % ATTAINED 7-9/

35. Please indicate what programs or projects have been developed and/or implemented at or in support of your installation since FY85 and how successful each has been.

	Please Check If Developed	Please Check If Implemented	If implemented, how successful? (Circle One on Each Line) Very Successful	Somewhat Successful	Neither	Somewhat Unsuccessful	Very Unsuccessful	
a. Energy awareness and education	[ ] 10/	[ ] 11/	1	2	3	4	5	12/
b. DSM program.........	[ ] 13/	[ ] 14/	1	2	3	4	5	15/
c. ESPC or other shared savings program	[ ] 16/	[ ] 17/	1	2	3	4	5	18/
d. Building metering ...	[ ] 19/	[ ] 20/	1	2	3	4	5	21/
e. Lighting projects.....	[ ] 22/	[ ] 23/	1	2	3	4	5	24/
f. Preventive maintenance	[ ] 25/	[ ] 26/	1	2	3	4	5	27/
g. Equipment replacement and modernization	[ ] 28/	[ ] 29/	1	2	3	4	5	30/
h. UMCS/Direct Digital Control system	[ ] 31/	[ ] 32/	1	2	3	4	5	33/
i. Alternative energy sources	[ ] 34/	[ ] 35/	1	2	3	4	5	36/
j. Building energy monitor program..................	[ ] 37/	[ ] 38/	1	2	3	4	5	39/
k. Installation energy management team.	[ ] 40/	[ ] 41/	1	2	3	4	5	42/
l. Water conservation	[ ] 43/	[ ] 44/	1	2	3	4	5	45/
m. Other (please specify) ______________ 46-47/	[ ] 48/	[ ] 49/	1	2	3	4	5	50/

CARD 09

36. How familiar are you with the retention of savings policy?

(Circle One)

Very familiar.................. 1 — 51/

Somewhat familiar........ 2

Not at all familiar........... 3 (GO TO 46a)

37. Has this source of funding been utilized as part of the energy management program at your installation?

(Circle One)

Yes .... 1 — 52/

No (please specify why not) .... 2 (GO TO 41)

If no, why not? — 53-54/

____

____

____

____

38. How many projects have been funded this way?

PROJECTS FUNDED [| |] — 55-57/

Don't know................. 998

39. What is the total dollar amount of the retention of savings funding obtained to date? Please round to the nearest $1,000. Your best estimate is fine.

$ [|] , [| |] , 000 — 58-62/

Don't know............. 99998

40. What is the total energy cost savings generated through conservation efforts over the last 5 years? Please round to the nearest $1,000. Your best estimate is fine.

$ [|] , [| |] , 000 — 63-67/

Don't know............. 99998

CARD 09

CARD 10 5-6/
1-4/

19

41. Please indicate how each of the following factors affects the use of the retention of savings policy provisions to generate funding for energy conservation programs at your installation. For each factor that you identify, please indicate how much it either constrains or facilitates your use of the retention of savings policy.

How does each affect your use of the retention of savings policy?
(Circle One On Each Line)

		Constrains Use			Doesn't Effect Use			Facilitates Use	
a.	Implementation policies/ procedures	-3	-2	-1	0	1	2	3	7-8/
b.	Complexity of implementation	-3	-2	-1	0	1	2	3	9-10/
c.	Cooperation from other functions or activities	-3	-2	-1	0	1	2	3	11-12/
d.	Command support............	-3	-2	-1	0	1	2	3	13-14/
e.	Contract policy/ procedures	-3	-2	-1	0	1	2	3	15-16/
f.	Accounting policy/ procedures	-3	-2	-1	0	1	2	3	17-18/
g.	Annual budgeting process	-3	-2	-1	0	1	2	3	19-20/
h.	Next year's utility budget reduced by amount of current year's savings...................	-3	-2	-1	0	1	2	3	21-22/
i.	Transferability of money	-3	-2	-1	0	1	2	3	23-24/
j.	Adequate funding available from other sources	-3	-2	-1	0	1	2	3	25-26/
k.	Belief that cost savings will be made available as stated in policy..............	-3	-2	-1	0	1	2	3	27-28/
l.	O&M budget shortfall exceeds energy cost savings in current year	-3	-2	-1	0	1	2	3	29-30/
m.	Other (please specify)								
	________________	-3	-2	-1	0	1	2	3	31-32/ 33-34/
	________________	-3	-2	-1	0	1	2	3	35-36/ 37-38/

CARD 10

20

42. Please describe the most important counter incentives or constraints that effect the use of the retention of savings policy at your installation.

____ 39-40/

____

____

____

43. Which of the following groups at your installation are aware of the retention of savings policy?

(Circle All That Apply)

Commanding officer	1	41/
Contracting department	2	42/
Comptroller	3	43/
Maintenance staff	4	44/
Base tenants	5	45/

44. How well is the retention of savings policy working?

(Circle One)

Very well	1	46/
Somewhat well	2	
Neither well or poorly	3	
Somewhat poorly	4	
Very poorly	5	

CARD 10

45. How could the retention of savings policy be improved?

______________________________ 47-48/

____

____

____

____

____

46a. Since FY85, what is the total amount of funding you have received for energy conservation related activities? Please round to the nearest $1,000. Your best estimate is fine.

$ [ ] , [ ][ ][ ] , 000 49-52/

Don't know.......... 9998

46b. Please indicate the percentage of this funding provided by each of the following sources.

ECIP	[ ][ ][ ]	%	53-55/
Other MILCON	[ ][ ][ ]	%	56-58/
FEMP (OSD central fund)	[ ][ ][ ]	%	59-61/
Base operations	[ ][ ][ ]	%	62-64/
Savings retained from previous years	[ ][ ][ ]	%	65-67/
Other	[ ][ ][ ]	%	68-70/
TOTAL	100%		

CARD 10

CARD 11 5-6/
1-4/

22

47. Please indicate how significant a problem these issues have been in developing and implementing a successful energy conservation program at your installation.

How significant of a problem for your energy program?
(Circle One On Each Line)

	Not a Problem					Large Problem	
a. Lack of preventive maintenance	0	1	2	3	4	5	7/
b. Lack of metering at buildings and facilities	0	1	2	3	4	5	8/
c. Relationship with utility company	0	1	2	3	4	5	9/
d. Guidance and support from next higher command	0	1	2	3	4	5	10/
e. Interest and support of base commander	0	1	2	3	4	5	11/
f. Interest and support of base tenants and building occupants	0	1	2	3	4	5	12/
g. Cooperation and support from other supporting activities/commands (e.g. Contracts, Legal)	0	1	2	3	4	5	13/
h. Lack of incentives for personnel to change behavior	0	1	2	3	4	5	14/
i. Lack of influence over military family housing	0	1	2	3	4	5	15/
j. Environmental compliance concerns	0	1	2	3	4	5	16/
k. Lack of funding available from your installation	0	1	2	3	4	5	17/
l. Lack of funding available from other sources	0	1	2	3	4	5	18/
m. Difficulty in obtaining funding for energy management activities	0	1	2	3	4	5	19/
n. Difficulty in obtaining funding for energy conservation projects	0	1	2	3	4	5	20/
o. Retention of savings policy implementation	0	1	2	3	4	5	21/

CARD 11

23

	How significant of a problem for your energy program? (Circle One On Each Line)						
	Not a Problem					Large Problem	
p. Size of energy management staff	0	1	2	3	4	5	22/
q. Energy management staff experience/knowledge	0	1	2	3	4	5	23/
r. Time available for energy management functions	0	1	2	3	4	5	24/
s. Lack of adequate/appropriate training	0	1	2	3	4	5	25/
t. Lack of funding for training	0	1	2	3	4	5	26/
u. Availability of training courses	0	1	2	3	4	5	27/
v. Time to attend training workshops and seminars	0	1	2	3	4	5	28/
w. Clarity of DoD energy policy and implementation requirements	0	1	2	3	4	5	29/
x. Location of energy management position within the organization	0	1	2	3	4	5	30/
Other (please specify)							31-32/
y. ______	0	1	2	3	4	5	33/
							34-35/
z. ______	0	1	2	3	4	5	36/

48. From the categories above, please list the top five problem areas beginning with the most problematic. Please use letters from above.

1. ☐ (most problematic) 2. ☐ 3. ☐ 4. ☐ 5. ☐ (fifth most problematic)

37/
38/
39/
40/
41/

CARD 11

49. Compared with what you think is reasonably possible, how effective is your energy program in:

	How effective is your energy program in? (Circle One On Each Line)					
	Very Effective	Somewhat Effective	Neither	Somewhat Ineffective	Very Ineffective	
a. Getting cooperation from other activities and functions	1	2	3	4	5	42/
b. Providing incentives for conservation behavior	1	2	3	4	5	43/
c. Generating cost savings	1	2	3	4	5	44/
d. Conserving energy	1	2	3	4	5	45/
e. Achieving conservation goals	1	2	3	4	5	46/

How could your energy program be improved (made more effective or successful)?

______________________________________ 47-48/

____

____

50. Is it possible to meet the following goals at your installation?

a. To identify and implement, by the year 2005, all energy and water conservation projects with a pay back period of 10 years or less.

(Circle One)

Yes 1 49/

No 2

b. To achieve a 30% reduction in energy usage per square foot from the 1985 baseline, by the year 2005.

(Circle One)

Yes 1 50/

No 2

If you think you can't reach one or both of these goals, why not?

______________________________________ 51-52/

____

____

CARD 11

25

51. Is there anything else about energy management at your installation that we should know about?

53-54/

Thank you for taking part in this important study. Please seal your completed questionnaire in the prepaid envelope and return it to RAND.

CARD 11

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